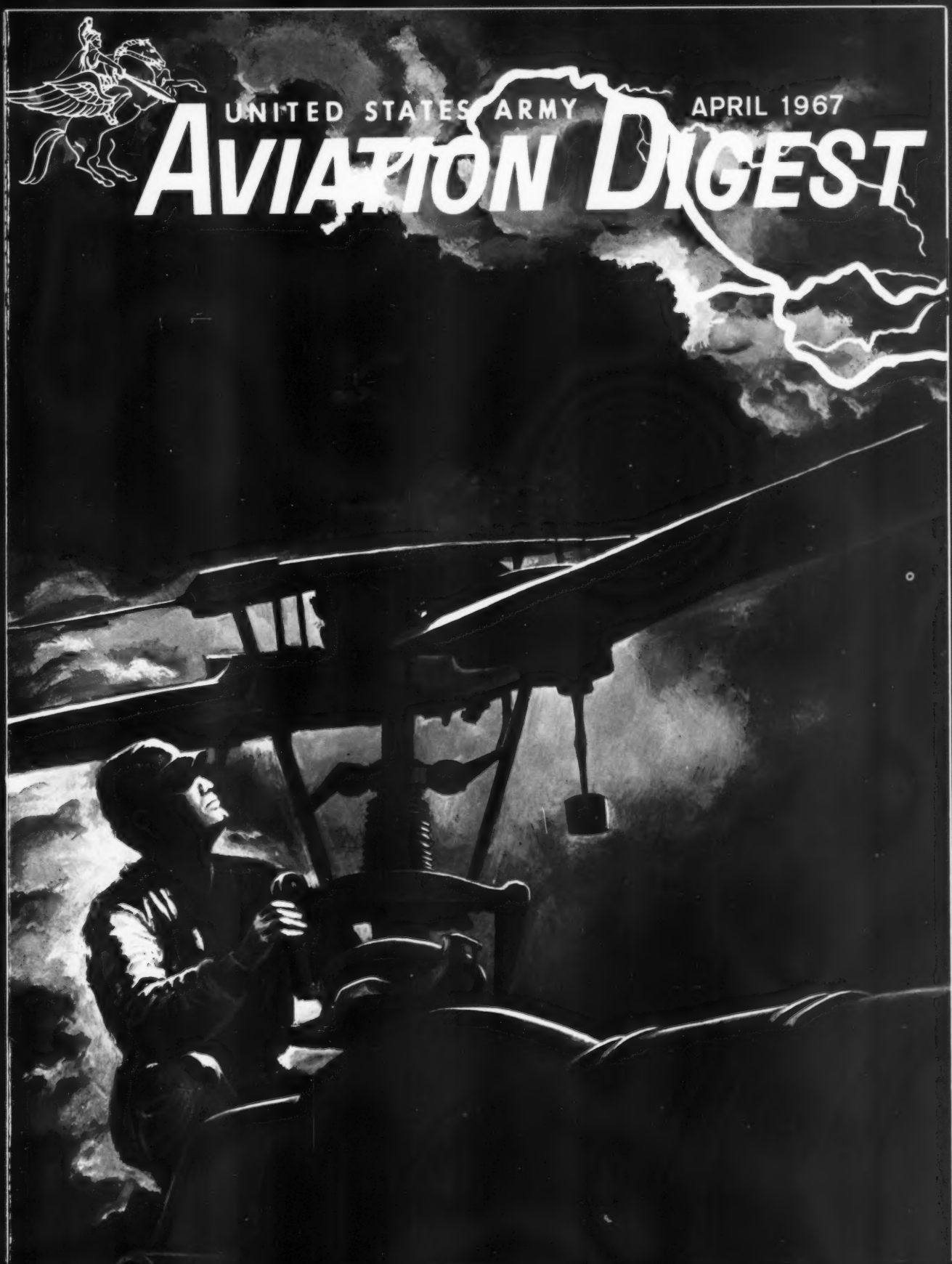
UNITED STATES ARMY
APRIL 1967
AVIATION DIGEST

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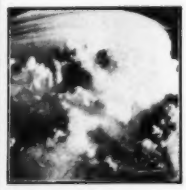

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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LETTERS

Sir:

I read with interest your article "FM Emergency Frequency" in the October issue of Army Aviation Digest. I agree with the authors that there are many circumstances under which such a frequency would be of great value, particularly if Army aircraft were equipped to guard it.

This problem was recognized in Vietnam and presented to CG, USA Combat Developments Command (CDC) in the summer of 1963, where it was pursued in the Special Warfare Group, CDC, and coordinated with the USACDC Aviation Agency at Fort Rucker.

The FM emergency frequency 48.6 was coordinated on a worldwide basis by the then Frequency Management Directorate, Office of the Chief Signal Officer. Although frequency conflicts existed in some countries, it was approved as a "Search and Rescue" frequency in many areas of the world. Records on this should be available at the Office of the Chief of Communications-Electronics (OCC-E). I do not know why this information has not been included in present frequency allocation publications.

Because of the expense of adding another radio to Army aircraft, and because the Army had already contracted to purchase a large number of survival radios which use 243.0 mc, the program for development of emergency radio equipment to operate on 48.6 mc was dropped.

LTC H. B. BLANCHARD, JR.
HQ, 14th Trans Bn (AM&S) (GS)
APO 96240

• *We plan to run an article soon on new developments in the avionics field which, we hope, will cover new proposals on emergency frequency allocation.*—The Editors

Sir:

An officer walked into my office recently and asked for a checkout in the U-6A. He was from another unit some 200 miles north which had no other U-6A pilots, much less an IP. Rated officers are scarce around here. I agreed to begin his checkout the following Monday. "By the way," he remarked, "I need a currency ride in the O-1, by local regulation." The officer's unit also had several Bird Dogs assigned and no one to fly them but him and he couldn't fly them because there wasn't an IP available to give him the check.

This officer had just returned from RVN where he had put over 1,000 hours in the O-1. He and his unit were stymied by an implementing regulation requiring that all pilots, regardless of how recent or how much his past flying experience included in a particular aircraft, be checked by an IP before he could fly. The AR of course does not require this, and that indicates some good thinking by someone. It says the commander will make sure his pilots are proficient before they fly. Now just how practical can you get? How rewarding this would be to the commander to know that he could make such a simple decision. If he could only do it! It should be his prerogative to determine whether or not his pilots need to be checked by an IP, given a refresher course or have any check at all.

I recently heard the following conversation and I quote in substance just to demonstrate how ridiculous this situation can get: "I had an old friend come into my unit with whom I had flown for years and for several hundred hours, side by side, in this particular type aircraft. As a matter of fact, he checked me out. He had also spent many hours in this same aircraft in Vietnam, in which he must now take a proficiency checkride. He had more time in the past six months than I did, and as an IP, and now I had to pass on his proficiency! Now I ask you, who's checking who for what, and why?" Unquote.

I wonder what the total cost is during the couse of a year for useless checkrides? It must be astronomical. I wonder where it all got started. Even worse, where is it going to end?

We are tying ourselves up in so many checkride knots that the unit commander, not to mention the individual pilot, cannot in many cases accomplish his mission due to the lack of IPs to give useless currency rides. The cause of this of course is the implementing regulations that completely defeats the purpose of the basic AR, and takes the prerogative out of the hands of the unit commander where it belongs.

Is there absolutely no more faith in the integrity of the individual aviator? I'm certain that the overwhelming majority of all pilots would demand a currency ride if there was the least doubt of his proficiency in his own mind. It's commonly known as the law of self-preservation.

Any implementing to an AR should be done to resolve administrative differences which are necessary, usually due to geography or organization, not to additionally and unnecessarily restrict. This is a sign of "cold feet" or the inability of the implementor to accept the freedom and responsibility given him by the individual AR, the same AR which basically was designed to give the unit the all-important flexibility to do its job.

MAJ STEPHEN FARISH
Seventh Army Safety and
Standardization Detachment
APO New York 09029

• *Currency ride anyone? We contacted the United States Army Board for Aviation Accident Research for their evaluation of the situation and their remarks follow:*

"What looks good on paper may not necessarily prove adequate in the cockpit. There is no way for a commander to determine pilot proficiency and currency by looking, *unless the individual is a personal acquaintance. The tool that a commander uses to determine currency, correct cockpit procedures and pilot capabilities is through his standardization pilot. This does not mean that the exception should never be made for individuals whose qualifications and capabilities are known, or when the mission is urgent and of utmost importance. Each ride in an aircraft should be a continued learning process for any pilot, regardless of his total time and qualifications. USABAAR accident files do not necessarily back up the writer's statement: 'I'm certain that the overwhelming majority of all pilots would demand a currency ride if there was the least doubt of his proficiency in his own mind.' In too many cases, rather than the law of self-preservation prevailing, the law of egotism is more dominant. A proficiency checkride given when not required never hurt anyone. Reverse the situation and you may save lives and machines. In other words, you have everything to gain and nothing to lose."*
—The Editors

A VIETNAM AFFAIR

Lieutenant Richard D. Donica

**Rain was still falling lightly,
but the lightning was increasing**

THE CLOCK beside the bunk indicated 0315 as the CQ shook CPT Dan Robin from his first restful sleep in days.

Robin was one of the top pilots in the 75th Aviation Company stationed in Plak Ko, Republic of Vietnam. During his 6½ months with the company he had logged over 600 hours and had seen sights that would make a veteran surgeon woozy. As a matter of fact, only a few hours earlier he had completed a 7-hour mercy flight involving a small girl who was the innocent victim of a grenade blast.

The CQ shook the captain relentlessly. He finally responded by opening one eye to see who the culprit was. After an exchange of pleasantries, mostly one-sided, the CQ commenced to tell Captain Robin that he was wanted in the briefing room immediately. As the CQ left with a large sigh of relief, Robin hurriedly put on his well-worn battle gear.

The night was unusually muggy as Captain Robin headed for the briefing room. He noted lightning flashes in the north and west. A light rain had already begun to fall. "What a night," he thought to himself.

Upon entering the briefing room he was met by the tall, husky operations sergeant. Their ensuing conversation was brought to an abrupt end as the company commander cleared his throat in one of those unmistakable ways.

"Captain, the reason you were brought in on this is that you are probably the best qualified aviator in the company." The CO spoke slowly, but deliberately. "Brigade is planning a full-fledged airmobile attack on zone E this morning at 0830. The operations sergeant is heading the advance party. It is his responsibility to go into zone E and establish a landing area for the assault. Weather has advised us to expect 100 to 400 foot overcast conditions at the time of the assault this morning, so it is of the utmost importance that you get him and his nondirectional beacon in location as soon as possible. The sergeant will continue your briefing in the flight planning room."

Haze began to clear in Dan's head as he and the sergeant walked to the flight planning room. He suddenly began to realize what he was up against. Here he was at 0330 in the morning beginning what was probably the most difficult mission he would ever fly. The thought caused a nervous feeling to run down his spine.

On the way to the flight planning room the sergeant briefed Captain Robin; then, using tactical maps, he pointed to the proposed landing site in zone E. The site appeared to be a clearing ap-

---

LT Donica was assigned to the Dept of Fixed Wing Training, Ft Rucker, Ala., when he wrote this article.

A Vietnam Affair

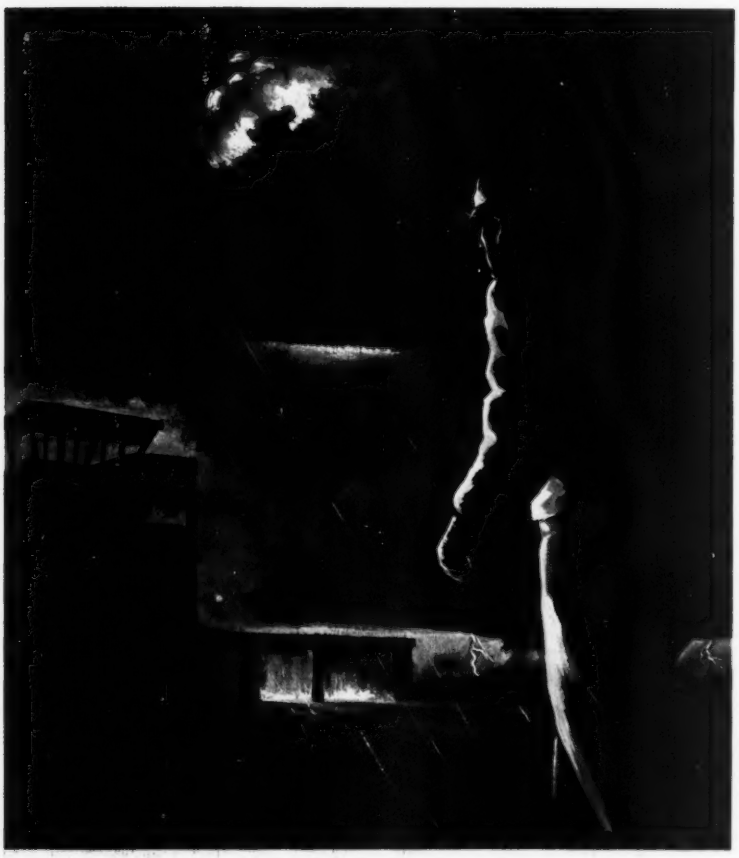
proximately 5,000 meters long and 2,200 meters wide, an ideal situation. There was no high terrain in this area, only thick jungle. The route to and from the area would be primarily over this jungle. Dan thought how bad it was to fly low level over this stuff under good conditions—but look at tonight!

The captain, the copilot who had just come in, and the sergeant tediously planned the flight. First they determined and plotted a course, then they plotted mileage marks, and finally computed the times. The flight from Plak Ko to the landing site would only take 30 minutes—but oh what a 30 minutes!

Hurriedly, Robin, the copilot, and the sergeant with three other members of the advance party headed for the UH-1B to be used for this all-important mission. Rain was still falling lightly, but those lightning flashes were increasing in number and ferocity.

Keeping the weather in the back of his mind for the time being, Dan set about making the preflight inspection of his faithful bird. This ship had seen him through over 200 hours since his arrival in Vietnam. Dan had great pride in his Huey, and well he should.

Approaching the briefing room, he noted lightning flashes in the distance



It was 0400 hours when the tower operator cleared Saber 1 for takeoff. Only 45 minutes had elapsed since the CQ had awakened Captain Robin, and here he was on his way.

The first 20 minutes of the flight went by almost too easily. They were right on course according to their charts, and checkpoint times were perfect. But then it hit the fan. First, the cockpit lights went out. Almost instantly they were in a heavy deluge of rain and getting bounced around mercilessly. Dan fought the controls to keep the aircraft upright as the copilot peered for a glimpse of the ground to check their course. In the back seat the sergeant, a veteran of Korea, sat expressionless. However, the other three members of the party were notably shaken.

Five, then six minutes passed as the heavy downpour continued. Robin's fatigues were soaked with sweat from the physical and mental exertion. As if without mercy, Dan began experiencing cyclic binding. It was all he could do to move the controls, but he decided to continue the mission. Only three more minutes remained of their estimate, but the rain prevented them from observing their checkpoints along the ground. Captain Robin became more uneasy as the realization that he might miss the objective became implanted in his mind.

Using his flashlight, the copilot constantly illuminated the instrument panel for Dan. The altimeter showed that they were at least 100 feet above any charted elevation along the flight route. But were they still on their intended flight route?

Suddenly, 29 minutes after takeoff, the heavy rain stopped as quickly as it had begun. At almost the same time lightning lit up the terrain, and low and behold approximately 2 miles in front of

them was their objective.

Saying a short prayer, Dan headed his crippled bird to the proposed landing site, and at the same time noted a large increase on the exhaust temperature gauge. Lightning continued to flash about them as they headed into the home stretch, and it looked as if the worst was temporarily over.

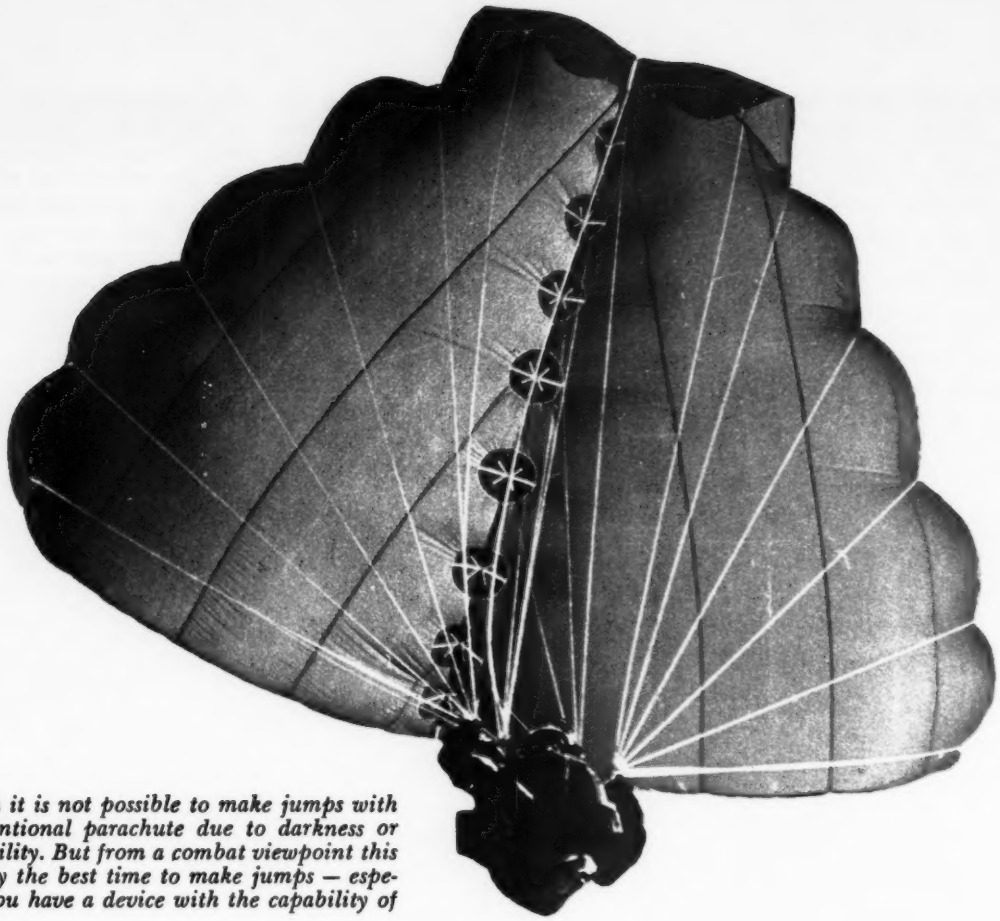
According to the sergeant, reconnaissance showed that the proposed landing site was relatively free of any obstructions, but did slope about 4° to the south. The Huey was approaching from the west in a downwind position. Robin decided to land to the east and into what little wind existed.

As he crossed the field and turned onto his final approach, it happened: the engine quit. Using all the strength and skill he had, Captain Robin demonstrated why he was one of the best pilots in Vietnam as he put the Huey on the ground with no damage.

The sergeant wasted no time in getting his party to work pacing the field and cutting down the obstructions that were there. Using the pacer's figures, the veteran sergeant determined the center of the site and set up his transit. With this, he determined the approach axis and other information that would be used in the assault tomorrow. He then headed for the downed Huey to get the all-important nondirectional beacon. Entering the aircraft he searched extensively, but the NDB was nowhere to be found.

He had forgotten to bring the NDB!

The sergeant continued the briefing in the flight planning room



Too often it is not possible to make jumps with the conventional parachute due to darkness or poor visibility. But from a combat viewpoint this is precisely the best time to make jumps — especially if you have a device with the capability of the

PARAWING

Colonel Harry L. Bush

Larry M. Hewin

THE TACTICAL ability to place an assault force into hostile territory—without the enemy's knowledge — continues to rank as one of the most effective maneuvers in combat operations.

To take this one step further, the ability to quickly supply troops cut off from their support units also ranks well up on the list of critical Army mobility requirements.

Both of these combat situations have this in common: the need to move men and supplies, always in a hurry, to specific areas where the success or failure of the mission can often be measured in hours or even minutes.

Both of the above situations have been, and are continuing to be, faced in Southeast Asia. And both of these situations may be met successfully through the use of a remarkable air drop device called the Parawing, which is being tested by engineers at the U.S. Army Aviation Materiel Laboratories (AVLABS), the Army's aviation research center, Fort Eustis, Va.

The Parawing has all the stability and reliability of a parachute, but there the similarity ends. For the Parawing possesses this dynamic ability: it flies and is accurately controlled like a glider!

A 24-foot, 14-pound Parawing

COL Bush is Commanding Officer and Mr. Hewin is Technical Director, U. S. Army Materiel Laboratories, Ft Eustis, Va.

The Parawing can be guided manually or by radio beacon

has been flown successfully with up to 750 pounds of payload. The same size and weight unit is also used for man drops. Successful experiments have been conducted with various sized Parawings for delivery of a range of payload shapes and sizes.

The combat advantages of an air drop device that can be accurately guided are enormous, AVLABS engineers declare. The ability to steer a deployable device has been proved during hundreds of test drops.

It should be noted that the Parawing employs two separate guidance systems, depending on its mission.

• When used by a parachutist, the Parawing can be guided in any direction, either manually or by a radio beacon. When the parachutist's destination is not visible when making a jump from offset position, or from conditions of low visibility such as clouds or night time, he will be able to navigate to his target by means of a miniature radio installed in his helmet. A ground transmitter guides his descent. The radio will also permit conversation with other jumpers which will reduce assembly time and permit receipt of instructions from the team leader.

• When used for delivery of supplies, the Parawing can be steered by a radio remote control system on the ground. The ground transmitter, which is currently being developed, is smaller than the standard Army field radio. It can be used for either direct radio command signals, that is, the operator instructs the system whether to turn right or left, or it can be switched to automatic, which will then cause the glider to automatically home in on the ground station. The ground transmitter also has a voice channel which will permit the ground operator to confirm receipt of the supplies to the air-drop aircraft. The airborne receiver weighs about 4 pounds.

The Parawing has these prime advantages:

• It can be folded, packed and deployed like a parachute.

• It performs in virtually any kind of weather, day or night.

• It provides a high degree of control for landing site selections.

• Its rate of descent can be controlled.

• It can be dropped offset from a landing site at a distance equal to 4 miles for each 10,000 feet of altitude. It will seek its final destination by automatically homing on a radio beacon. By its long glide ratio, it will substantially reduce aircraft exposure over enemy territory and thus avoid jeopardizing the goal of an undercover mission.

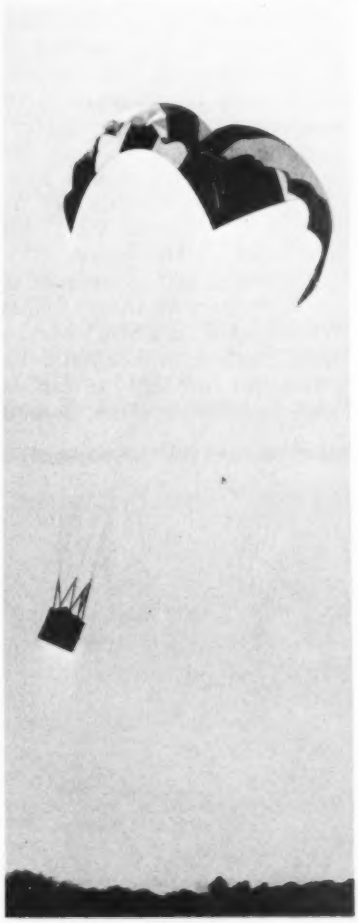
• Its fast opening permits it to be used at low altitudes when required. With various system configurations, drops have been made from as low as 150 feet to as high as 30,000 feet.

• Radio-controlled night drops can be made. AVLABS engineers note that personnel air drops may also be made at night or in daylight conditions with zero visibility through the use of the special radio-equipped helmet worn by the jumper described earlier. In short, the parachutist could be guided to a predetermined landing site via the radio beacon used for Parawing supply drops.

Although the Parawing sounds like a dramatic new development in aerial delivery, actually the concept has been around for some time.

The Parawing is an offshoot of the flexible wing concept originated in 1948 by Francis M. Rogallo, head of the low speed vehicles branch at the Langley Research Center of the National Aeronautics and Space Administration.

In 1961 AVLABS engineers began experimenting with the flexible wing concept—from which the Parawing and the Precision Drop Glider (both AVLABS projects) were the outgrowths. The 500-pound payload Precision Drop



A radio controlled Parawing comes in for a landing with a 500-pound payload

PARAWING

Glider (PDG), a device for radio-controlled air drops of supplies only, is now being developed for the Army by the Ryan Aeronautical Company under a $1,100,000 AVLABS contract.

The PDG uses a wing similar to a Parawing, but is more complex since it employs air-pressurized tubes for leading edge and keel stiffeners. This configuration does, however, give a slightly higher glide ratio (about 3-1). Due to the development time required for the radio, the PDG will be ready for service testing in 1968.

The feasibility of the Parawing has been demonstrated in AVLABS research and in joint efforts with the National Aeronautics and Space Administration. Development of operational systems is dependent on user interest. Due to the simplicity of the concept, a relatively short lead time could be anticipated.

The design and construction of the Parawing is amazingly simple. When packed on a man's back, it looks identical to a conventional parachute. Although it can be made in almost any size, depending on payload requirements, the 24-foot wing weighs only 14 pounds. It has conventional parachute suspension lines and is constructed of a low-porosity 2.2 oz/sq yd resin-coated nylon fabric. It has approximately 400 square feet of material surface. It is flown limp; that is, it has no ribs or stiffeners and can be deployed either by static-line or ripcord. Initial deployment is attained with a standard pilot parachute. For ultra-fast opening, the static line can be attached directly to the sleeve, thereby eliminating the pilot parachute.

FIRST TEST JUMP

In the spring of 1966, members of the United States Army Parachute Team, Fort Bragg, N. C., conducted a series of test jumps to investigate the military worth of the Parawing. The jumps were made under the direction of Captain James M. Perry, Parawing project officer. Here it must be noted that the Parawings used in these jumps were hurriedly engineered. And since that time, based on what was learned during this and subsequent programs, significant additional improvements have been made.

The first live jump was made by Sergeant First Class Loy B. Brydon at St. Mere Eglise Drop Zone, Fort Bragg, N. C., on 27 March 1966.

Here is a verbatim description of that jump, included in a report filed by Captain Perry.

"Initial Live Jump: The jumper was wearing a standard sport parachute harness with a 32-foot parachute pack tray. The IDG (Individual Drop Glider—a 24-foot Parawing) was packed in a standard Para-Commander launching sleeve to which a high-drag 40-inch pilot parachute was affixed. The jumper carried a 24-foot emergency parachute attached to chest D-rings.

"The only special instructions given to SFC Brydon related to the 'cutting away of the wing should it malfunction.' Maneuvers and decisions for programming stalls or for landing the glider were left to the prerogative of the jumper.

"The drop was executed from a U-10 aircraft flying at 5,000 feet and 45 knots indicated airspeed. Deployment was immediate and clean and the wing apparently flying with 1.5 seconds following activation of the pilot parachute.

During the initial test the Parawing deploys at 5,000 feet (left) the parachutist nears the ground (center) and prepares to land (right) . . .

The jumper stated that he executed a 'clear and pull' which is tantamount to about a 2-second delay. The opening shock was not excessive but was noted as slightly more than that of a T-10 parachute.

"Some immediate tail-flaring and tendency to stall was observed. However, the jumper declined to release the glider in an effort to determine what was causing the difficulty.

"After executing several 360-degree turns, both right and left of the wind line, SFC Brydon turned the Parawing upwind and attempted to penetrate a 25-30 knot wind. There was evidence of considerable forward speed but since this was the initial jump and there was no experience factor in how to properly modulate the maximum lift-over-drag, winds aloft caused a drift of approximately 5,000 meters across the ground. Touchdown was accomplished without difficulty. It is noteworthy that a quick computation of this first jump revealed 10-11 feet per second descent rates and a forward speed of approximately 20 feet per second. Glide ratio figures were unattainable. Subsequent jumps have verified these figures as fairly average. The test subject in this case weighs 225 pounds suspended. Touchdown was a very light, two-legged, stand-up landing. Even though there were ground winds gusting to 20 knots, the Parawing collapsed immediately and the jumper stated that 'I simply stepped down and got off.' "

A new method of infiltration

The report also notes that in its form at that time, the Parawing was extremely sensitive to control and that "there were a considerable number of things to learn about proper control."

However, in the final summing up of the results of this first test by the Army Parachute Team, this is the potential of the Parawing as Captain Perry sees it:

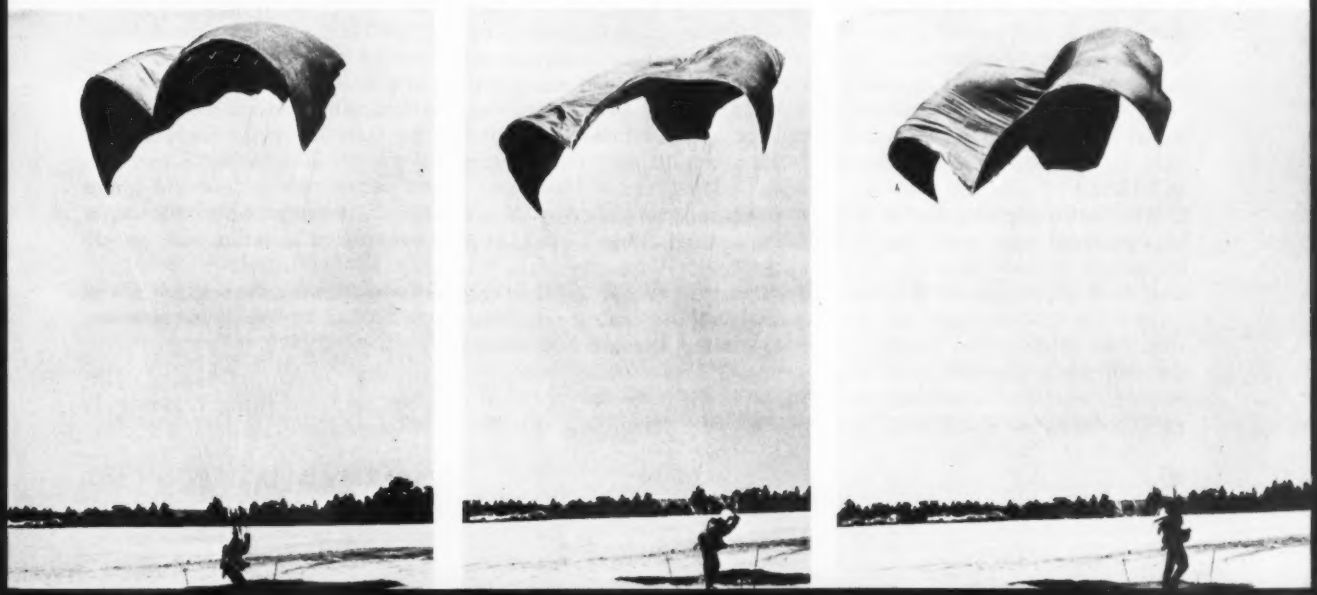
"Conclusions: The Rogallo Parawing concept is a feasible and utilitarian personnel carrier. It has demonstrated its ability to deploy properly, fly in a fairly stable attitude and the 24-foot glider will land loads of up to 250 pounds accurately and easily. It has vast potential in both military and sport parachuting.

"Allied to a final guidance system, this particular vehicle presents a new and radical method of infiltration, utilizing high-altitude glide-in techniques."

The Parawing's unique ability to glide long distances in any desired direction may also make it useful as an emergency recovery device. If pilots or crewmen have to leave an aircraft at low altitude, they can bail out as low as 150 feet and survive. If a crippled aircraft has to be abandoned, the crew would have the distinct advantage of being able to choose a landing site, be it an open field or open water, away from hostile forces. Also, a gliding Parawing obviously presents a more difficult target than the conventional parachute. In general, survivability should be much higher for the man who can glide several miles, possibly away from the hostile territory, than it would be for the man who must, as a rule, descend within a mile of the area where he ejected, due to the nature of the conventional parachute.

The Parawing, with its unique ability to be guided and flown like a glider, presents a new dimension in Army mobility.

. . . the parachutist completes a standup landing with ease (left) and begins to collapse the Parawing (center) which starts to fold (right)



COMMON SENSE VS TOWERING "Q"

Captain James A. Hall

IT ALL STARTED in a classroom in 1961, when a ground school instructor began to try to teach me about weather, and at this particular time about thunderstorms. He explained vertical winds in excess of 65 knots, the towering Q's (thunderstorm cloud formations) ability to climb to 40,000 feet in 30 minutes or less, with hailstones big as baseballs, with shear winds that can snap an aircraft in two, and gusty surface winds in the neighborhood of 60 knots.

The instructor went on to tell of a personal experience that had happened a few years ago. He was aboard an aircraft at about 15,000 feet IFR and all of a sudden they were in the middle of an imbedded thunderstorm. His account was that the aircraft was kicked down to 6,000 feet and then thrown up to 30,000 feet several times. The storm pockmarked the aircraft with hail and then threw it completely clear of the cell. They managed to land the aircraft but it was damaged so badly that it was never to fly again.

Well, I had seen summer afternoon buildups and thunderstorms all my life, but I had never seen anything worse than a few surface gusts and an occasional hailstone about like a pea, so I just didn't believe him.

I remembered what he had said for test purposes but I would have to see inside a thunderstorm just for myself to believe all that hogwash! Well my chance wasn't too long coming, because I eventually got to C (instrument) phase, and it was in the late summer months.

We were returning to Fort Rucker from New Orleans, socked in tight and everything was going fine. But this was just the calm before the storm. Then all heil broke loose. All of a sudden the altimeter and rate of climb indicator went wild. The altimeter was indicating from 6,000 feet to 12,000 feet and the vertical velocities we were indicating were terrifying. The aircraft pitched, rolled, and yawed, the water hit the aircraft by the buckets full. We had entered at 7,000 feet with an outside temperature of about 58° F. Wonder what that water would have been like had the outside temperature been 15° F? All of a sudden we were out of it and once more in field grade weather,

CPT Hall is assigned to the OV-1 Branch, Flight Training Div, Dept of Fixed Wing Training, Ft Rucker, Ala.

The storm was now over the field, but I was able to stay lined up with RY 24

smooth as silk. We were only in the cell 3 minutes but it seemed like 3 hours. I had learned a real lesson.

This experience had been enough to suffice for a very long time, but as time went on and I became more experienced I found that maybe weather wasn't so tough after all. Then I got a refresher course.

I had flown my first student in the OV-1 and was returning to Cairns Airfield for the second one. A big black weather cell was sitting about 15 miles SW. I had already decided that if I hurried I could get off before it crossed the airfield, give the dual period, and land after the thunderstorm had passed. Good planning, I thought!

After about 30 minutes I had the second period student in the aircraft and was cleared to runway 06, the black cloud coming closer. The wind shifted and the runway was changed to 24, and the cloud came closer, but I still had time to make it off. Tower cleared me off and away I went into the rain. I made a right turn out at the field boundary to remain VFR and I could see only straight down. Tower called me and advised that I had better check with ATC for better weather information. I did and the cell was a line 150 miles long and 60 miles wide. I changed back to tower frequency and told them I would like to come right back in. I was cleared to land by this time lined up on RY 24. The storm was just about over the field now and the sky had literally turned to water. With occasional glimpses of RY 24, I managed to stay lined up with it. Then there was a period of time I could see nothing, and the next time I could see through the rain I was over the RY numbers at about 50 feet. The tower was now saying winds at 180° at 35 knots.

I finally managed to touch down and stop the aircraft, but the wind was still trying to blow me off the active. After turning off the active I lost the crosswind effect and taxied on to the tiedown. From takeoff to touchdown on this flight was 5 minutes.

If there is a moral to this little article it must be that the odds are against you; don't wager life and property against a towering Q.

Helicopters IFR

Captain Wayne W. Wright

HOW MANY LIVES have been jeopardized or lost or critical missions delayed because the majority of U. S. Army rotary wing aviators have had no instrument flying capability?

This is not a new problem. In the past, helicopter instrument flying has been received with little enthusiasm for primarily two reasons.

• One is the argument that there is insufficient need, since helicopters can fly below the clouds and accomplish the mission in most cases. Perhaps, but place this hypothesis in a combat situation such as we are faced with in South Vietnam. The Vietnamese terrain can generally be grouped into two categories, delta (flat) and mountainous. In the delta region contour flying, which becomes simply low flying due to lack of contours, can become a hazardous business. Since the VC naturally assemble along the frequent treelines and canals, they have an opportunity to place horizontally aimed fire on any aircraft which comes within their range. With the more frequent appearance of 12.7 mm heavy machineguns (HMGs) this range is considerable, and more helicopters plus more HMGs equal more opportunities.

In the mountains of Vietnam aviators are faced with flying between mountain ridges, occasionally beneath an overcast, again presenting a convenient straight shot to insurgents posted on the valley sides. In the mountain situation there is the additional possibility of being trapped within a valley when clouds descend low enough to seal off the passes. Lacking an instrument capability and navaids, a helicopter pilot has no recourse except to wait for clearing or attempt a low level flight through passes with visibility dropping occasionally to zero.

• The other major factor heretofore limiting general use of instruments in helicopters is the attitude of aviators. Most helicopter pilots have only a slight knowledge of attitude instrument flying and even less knowledge of en route air traffic control procedures and use of navaids. Ever-present rumors advanced by some fixed wing instrument rated aviators and noninstrument trained rotary wing aviators concern lack of stability, constant attention re-

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CPT Wright was assigned to the Instrument Div, Dept of Rotary Wing Training, Ft Rucker, Ala., when he wrote this article. He is now serving in Vietnam.

quired, lack of equipment, etc. in helicopters. These have influenced the 3-3 aviator to the extent that he frequently approaches the thought of operating rotary wing aircraft under IFC with less than enthusiasm. This attitude can largely be subscribed to a lack of familiarity.

Increased activity in the Republic of Vietnam has drastically pointed out the number of aviators not capable of using their aircraft efficiently in all situations. Thus a demand was placed on those responsible for training new pilots for more instrument rated rotary wing aviators.

The U. S. Army Aviation School responded to this request by developing the Tactical Instrument Training System as part of a new concept to turn out initial entry students specifically oriented for duty in Vietnam. During the course of instruction the student pilot receives a total of 50 hours of hood in the TH-13T instrument trainer. This qualifies him for the "pink card," a tactical rotary wing instrument ticket.

The tactical instrument system uses LF nondirectional beacons and the mobile tactical radar set as aids to navigation. Actual usage is intended for short distance operations using direct routes with a minimum en route altitude of 500 feet AGL (above ground level). Holding and descents are made on the beacon in a figure eight pattern accomplished alternately by flying headings from and homing to the beacon. Aviators are authorized to descend to a minimum altitude of 200 feet AGL and a visibility of 1/2 mile.

An alternate is required for all flights using the tactical system. The most efficient means of recovery at the alternate is by using the mobile radar set for GCAs (ground control approach) to a minimum authorized altitude and visibility of 100 feet and 1/4 mile. Although a GCA may be used if warranted by a low ceiling, standard ADF approaches may also be used if established.

The area for an approach is preselected, and a beacon is erected by a team which also clears the highest obstacles in the approach area if possible. A 2,000′ by 4,000′ buffer zone is required around the beacon for clearance, and all minimum altitudes are measured from the top of the highest obstacle within the zone.

Before beginning an approach, ground personnel furnished information concerning axis of approach, weather, surface winds, enemy activity, and location and condition of the LZ. Extensive preplanning of each flight is used to provide pilots all possible information before departure.

Takeoff minimums authorized are 100 - 1/4. Radar departures may be useful to vector aircraft on course or to establish them VFR-on-top in the case of localized cloud coverage.

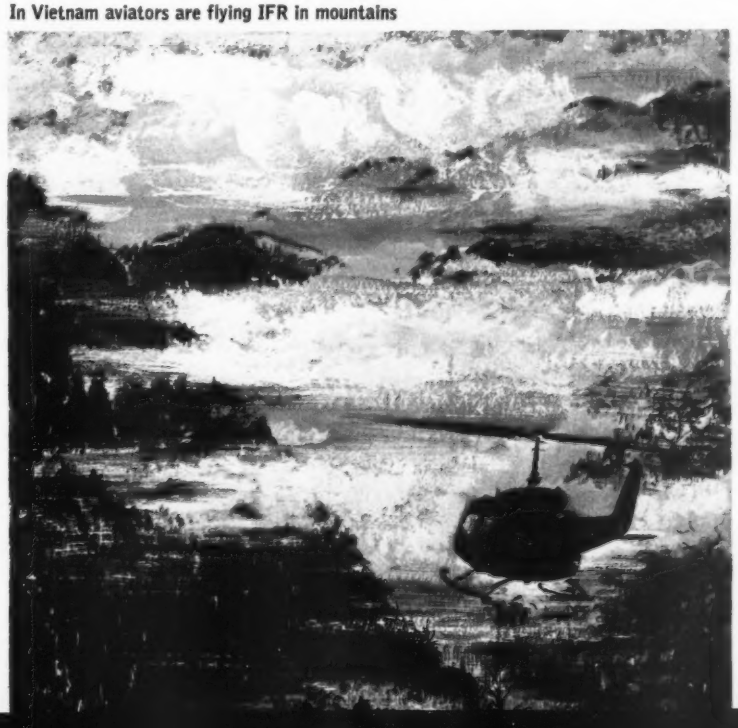
Air traffic control and procedures are kept as simple as possible by prior coordination with the flight operations center and other control agencies as dictated by the tactical situation.

The tactical instrument system was devised to meet the need for an instrument rated aviator in the present tactical situation, using available aircraft and navigational facilities. The rating provides a basis for later training the aviator to attain a standard instrument card. At present a standard ticket would be of little use in the tactical zone due to the lack of additional facilities such as VOR, ILS (instrument landing system) and attendant control systems.

Rotary wing aviators without an instrument capability at present may acquire the tactical instrument rating under the authority of AR 95-63, using the procedures approved in Training Circular 1-29.

Acquisition of a helicopter instrument rating will not only increase the effectiveness of helicopter operations, but will add greatly to the confidence of individual aviators in their ability to accomplish assigned missions in marginal weather and night operations.

In Vietnam aviators are flying IFR in mountains



MOHAWK OUTLOOK

Colonel E. L. Nielsen

THE SUCCESSFUL application of the Mohawk surveillance system in Vietnam has resulted in Department of Defense approval for further procurement of the aircraft and its ancillary equipments. Considering that the Mohawk is the Army's first venture into development of a system of this type, its record in Vietnam is a tribute to those who advanced it to its present state.

The Mohawk was conceived to provide the battlefield commander with a highly responsive intelligence gathering capability directly under his control and capable of performing its mission on a round-the-clock, all-weather basis.

Rebirth of the program has provided a unique opportunity to take a second look at the system with an eye toward improving the overall effectiveness and maintainability of the complete system.

With announcement of further Mohawk production in early 1966, Army Materiel Command was directed to prepare recommendations on the configuration of the new buy. This was accomplished by compiling a lengthy list of desired improvements, then establishing the cost and availability of the various items. It was then possible to define the precise configuration of each year's production buy and its funding requirement.

The list of improvement items was compiled after careful screening of the results of numerous discussions with user activities, the Electronics Command, the Aviation Command, DA, CDC, the Mohawk systems contractors and other equipment vendors.

At this point, it seems appropriate to digress briefly to mention the Mohawk modernization program now underway. The purpose of the modernization program is to update all delivered OV-1B (SLAR) and OV-1C (infrared) aircraft with all outstanding MWOs, AN/APS-94C SLAR, and AN/AAS-14A Infrared. Provisions will be made on the OV-1C for an electronics flasher and a forward looking panoramic camera. Because of time and dollar limitations, the FY 66 OV-1C aircraft will be essentially in the configuration of the OV-1C modernized aircraft.

The FY 67 OV-1C aircraft will incorporate new communications equipments, a new ADF, VOR, IFF, a new heading reference system, and TACAN. Wing store stations will be opened to accommodate special pod mounted equipment items under development by the Electronics Command. The KA-30 camera will be replaced with a KA-76 having data annotation. A new voice interrupted priority system is planned along with a voice recording system to facilitate crew debriefing.

It is also intended that a flat-rated turbo prop version of the T53-L-13 turbo shaft engine will replace the present T53-L-7. The L-13 engine will deliver standard power even under hot day conditions, a boon in areas like South Vietnam. The long (48 foot) wing presently employed on the OV-1B aircraft will be on the FY 67 OV-1C as well. Better cockpit arrangement will be attained by relocation of a number of instruments and controls. The use of certain TAPE instruments will provide sufficient space to make the rearrangement possible.

At the present time it is intended that FY 67 and FY 68 configurations will be identical.

The next major change to the Mohawk system presently proposed for later production is identified as the OV-1D product improved Mohawk and represents the ultimate improvement to the Mohawk system under consideration at this time.

Principal feature of the product improved Mohawk is a multisensor capability which will permit one basic aircraft to be quickly configured in the field as either a SLAR or IR aircraft. The PI Mohawk incorporates improved SLAR and IR sensors, a vertical panoramic camera, a single data transfer system for both SLAR and IR, a new Doppler inertial guidance heading reference system, the LOH communications/navigation package and new electronic penetration aids.

The overall Mohawk improvement program has been designed to provide the best possible capability in the field in the earliest time frame commensurate with the availability of funding and good configuration management practice.

It is anticipated that the Mohawk will be with us for a long time. We in AMC intend to make certain that the Mohawk surveillance system will continue to advance as an intelligence gathering vehicle.

COL Nielsen is Project Manager, Mohawk, U. S. Army Materiel Command, Washington, D. C.

Debut of Super Lou

"Confessions" of a Huey

Captain Gregg S. Bond

DAWN IN VIETNAM would be more beautiful, with its flaming crimson and gold sunbeams radiating widely across the misty, clouded land, if only I had someone with whom I could share this glorious sight. Not everyone can appreciate beauty alone, you know.

There is even beauty here in Tuy Hoa, the centerline of this humid, elongated republic, where the towering, rugged mountain ranges stretch into flat rice paddie plains and rolling miles of sand. The entire countryside reaches out to touch and blend with the twisting, changing shoreline of the gigantic South China Sea. If I did not know better, I would assume that everything is peaceful, contented, and quiet.

But here I am sitting all alone in this blowing sand, a slight sea breeze sneaking up my tail pipe, within running distance from my commander's canvas hooch yet far enough away that both of us won't get caught in the same suicide attack or mortar barrage. They aren't fooling anyone. Why else am I sitting here all alone when other UH-1D helicopters are lined up smartly on the asphalt pads? Do I have to prove myself first? Is that it? Sure, I am new to this game, brand new in fact, but I'm smart enough to know the score.

One glance through my aircraft records would reveal that I flew with some of the best pilots back in the States. Isn't that enough? They called me the hottest Delta in the air. Of course I was fresh off the production line then, but just give me a chance. Maybe it's because I have only been in coun-

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try a few days. Wonder if it shows?

Lord only knows I've tried to perform with the best of them, but "ash and trash" runs are strictly for the birds. I have been flying up and down from one airfield to another so high above the ground that my heater almost bleeds. However, I have been able to overhear many war stories and I've learned a lot from the experiences of others. In fact, lately I have learned so much monitoring oldtimers that I have a steady pain in my fuel tank. I am so nervous that I have to privately drain a little fuel before each flight, "to separate water and impurities," as my pilots would say. I used to think that I might be scared over here or a little apprehensive at times, but I never dreamed it would be continuous. Hope nobody's noticed.

I can't even sleep well at night. For example, all of the helicopter crews in those comfortable hex tents and rainproof GP stalls slept as soundly as a rocket in a pod, but not me. It was so cold last night that my filter wouldn't filt and my throttle wouldn't throt. I don't know; maybe I am just restless.

At least the weather looks promising this morning, not like the other day when we flew into rainshowers and heavy fog and suddenly the winds violently changed and became unpredictable. Funny, there for awhile I had the feeling I was the only confident one in the crowd. I must have been mistaken, because once we landed everyone joked and talked up a storm, as if the whole thing had been routine. Suppose I will ever be as casual and cool?

Let's face it, I know I am going into combat—that is the sole reason I was "chosen" to come over here—but for crying out loud, when? Who knows? Maybe I'll luck out like some and miss all of it.

Well, my crewchief fed me a good breakfast today, anyway: 1,100 pounds of JP-4 fuel topped off with a shot of 7808 hydraulic fluid and MIL 5606 oil. For a bonus, he cleaned my windshields, checked my rotor head, inspected me from head to toe, secured all dust covers, and even added some ammunition for my door guns. That's strange, first time he has done that. Come to think of it, when he left he patted me on my rear and murmured something like, "Cherry picking time, dearie." Wonder why?

Uh oh, something is up! Crewchiefs and gunners are all heading toward their ships. Too early for a mission, isn't it? I'll say this, they sure are keeping themselves busy, not even glancing my way. Never noticed gunners working so hard on their machineguns before. I wonder.

Sure enough, here come my boys. Well, "Super Lou," you may have your question answered. You have had breakfast, been preflighted, refueled, and armed with extra ammunition. This may be it.

What is this, anyway? My crewchief and gunner aren't talking or even cussing much this morning. Wish they would say something or sneak me a clue. Hey, clumsy! Take it easy back there in my well, and you up there, get off my back, huh? Easy, Super Lou, easy. Save your strength for living up to your name. Lord only knows the rest of your family has made a special name to be proud of over here.

That cinches it. There goes the flightline truck chocked full of slick pilots. And I see the gun pilots plodding through the sand again toward their gunships. Everyone is burdened down with maps, chest protectors, helmets and weapons. Must be a big Romeo Foxtrot today. I learned that from my crew: Vietnamese lingo which means "important mission," I think.

It must be important, because here comes my boss in a hurry, discussing something with the other pilot. First time I have seen both of them carrying a rifle. Super Lou, you are about to be initiated. Play it cool, girl, play it cool.

When they put their minds to it, they don't mess around. Everyone is strapped in, my battery checked ok, switches are on, and we are just sitting here, waiting and listening. Wish someone would say something.

Hey, one Huey is cranking, and there's another, and another. I get zeus bumps all over my skin every time the trigger ignites that spartingling whine from the turbines and the blades start swinging under power. Wish I could drain some more fuel.

Something must be wrong! My boss is yelling at the enlisted men, and they're both yelling right back. It's only, "Clear—coming through"—the all-clear signal to crank. Snap out of it Super Lou. Give him a smooth, fast start and settle down to business. It will be a disgrace if he scratches you this close to your first mission. He has hit the trigger, so watch the clock, Boss.

Why so many aircraft? Where are we going and what's up? Pick up speed you freeloading rotors; turn pardners turn. Listen to the airwaves. They are wild with pilot chatter checking in. I have never seen so much excitement. Maybe it's just me. The others are still "cool." Attaboy Boss, "This is

Debut of Super Lou

Screaming Eagles and slicks lift off from a Vietnam staging area

seven; we're up."

No time to daydream now. Full power, engine and transmission oil pressures seem fine, temperatures are ok and everything feels "in the green." Super Lou, don't make a mistake. Don't give them cause to call you a "sick ship" like they do some. Remember, everyone's watching you, especially your crew.

The other ships are lifting off, leaving us. What about Super Lou? There go chalks five and six, but what about sev . . . ahhh, he's pulling in my power. Easy now. Don't let the blowing sand bother you. He's pulled in sufficient torque and my tail pipe temperature is about right. I am lightly dancing on my skids, we're picking up smoothly. Give me a little left pedal, Boss; not too much. Good, we are off and climbing. Now we must jockey for position and hold it steady.

I have been so busy that I missed the instructions from our lead aircraft. Was he talking to me? Wait a minute, we are descending already! Are we aborting the mission, or was this just a training flight? I see yellow smoke on the ground and we are dropping directly for it. There are soldiers in the area who appear to be waiting for pickup. This must be the staging area where we load our troops and move out smartly. There will be no training today, Super Lou; only one big test—actual combat.

Here they come, the Screaming Eagles! Heard a lot about them. People say they are real professionals. They better be. I don't want any amateurs slowing me down on my first combat assault. Gee, if I carried that much gear on my back I would flameout, unwind, and settle right in. Climb in, boys. I'll get you to your destination, God willing. Just a paint peeling minute! Not all of you! I'll fly like a torque wrench with six of you on board, including radios, weapons and packs.

What are you doing, Boss, pulling pitch? What about my center of gravity? Super Lou, give it all you have got. These men have a tough job to do, and you can't let them down. Like the Boss says, "Get them in and get out." I am learning to speak their lingo, so now I'd better learn how they fly.

Our ships are lifting off again. There go chalks five, six, and here comes Super Lou. Hey, I can't see! The sand is blinding me and the rotorwash from the other helicopters is slapping me in the face. Oh, no! Not the rpm warning signal! I have got to give more power. Don't pull so hard, Boss! That's it, ease off. Get me back to 6600. Don't stop now!

We are off the ground, but where are we? I still can't see. Where are the other helicopters? The sand is finally clearing, but what is this? Fifty feet from the ground! What if I had failed him?

I cannot believe we are still in formation. Thirteen slicks, four guns, and bellies full of hungry Screaming Eagles climbing together for the cool, thin air and a safe, cruising altitude. I am no longer alone.

Super Lou, you are doing just fine, so far. At least you aren't jockeying around like some of them ahead of you. Certainly requires a lot of power, though. My exhaust pipe is almost pooped.

Since when do we let gunships pass us speedy slicks? Now there is one on each side moving to our front with "balls of their feet to the wall," as we say in flying circles. There goes the chatter again, everyone transmitting at the same time. With three different radios turned on, how do you know who you are talking to? It's enough to wear a nickel-cadmium battery out.

Those are fighter planes up ahead streaking toward the ground. They are actually dropping bombs onto a target. Wait till I tell the gang back home! I have a ringside seat, too. Wait

Just a paint peeling minute!

a minute! We are descending again. Do they expect me to land down there? The A-1s are still strafing and smoke is completely smothering the lima zula—that means "landing zone."

Fifteen hundred feet per minute! Cheez, that's not Rucker's way of doing it, especially in formation. We are a little fast, too, aren't we? Three hundred feet from touchdown and still clocking 80 knots. Wow!

The airwaves are dead quiet now, like a flying graveyard. Why? Somebody say something. Radios out? I feel weak all of sudden. Get ready, Super Lou. Your debut has arrived.

What was that weird explosion? Something has got to be wrong. It is coming from everywhere. The gunships! They are firing rockets and machineguns all all around us. I hope they know what they are doing. Why didn't someone warn me? Rockets are now exploding all over the landing zone; I can hear their thundering thump.

Short final now. The lead ship is decelerating too fast. Watch out, Boss! Remember our heavy load. Who told my door gunners to open fire? Scared the spark out of me! Everyone now is firing toward the LZ. The sound is deafening. I can't think.

RPM! RPM! I am shuddering all over, from chin bubble to tail light. It can't be just fright. Someone just screamed, "Enemy fire from the flank." Which flank, for crying out loud? Red smoke has been dropped from the lead ship. I don't have time to look. We are sinking in; Super Lou, power! Pull pitch, Boss! What are you waiting for? Hold it, that's not solid ground beneath us. I am falling into tall grass and swampland. Wish I could close my eyeshields.

Hope nobody saw that lousy bounce. Go get 'em, Screaming Eagles! They're gone; must have jumped before we even landed. Well, they are in; let's get out.

Lead ship is pulling pitch, 8 seconds since we touched down. We are with him this time. What a sight! Look at those ground pounders move into the woods! Hey, Lead, you are receiving fire. I can see the tracers zipping all around you. Climb, man, climb!

Thirteen slicks in and thirteen slicks out. The guns are still back there hitting enemy targets spotted by the Screaming Eagles. The boss just told them we would be back with more troops, all of their equipment, and plenty of supplies. Evidently, that was just the beginning.

That was my understatement of the year! As I remember, we returned to the lima zula three more times. Then, when the Screaming Eagles began capturing jump seats full of Victor Charlies, we hopped around from crater holes to blasted patches, settling in and wallowing out each time. I have had my power pulled so much that my tail is torqued, my rotors are still, and my pedals are sore.

It feels good to sit in the sand again. Gives a fuselage time to relax, an opportunity to think. They say I am on standby, so it looks like you have made the grade, Super Lou.

You know, dusk in Vietnam would be more breathtaking and beautiful, with the crimson sun settling lazily behind the mountains, closing out the world for another day, if only I had someone with whom I could share this glorious sight.

Door gunners are ready to return fire as the Hueys make their final approach to the LZ

Steep Angle GCA

Major Charles Jolley

NUMEROUS investigations have proved the feasibility of using helicopters in instrument flight conditions to provide all-weather capabilities. There are pressing requirements to exploit inherent flight characteristics of helicopters and future steep gradient aircraft. By using steeper approach paths, it would be possible to reduce airspace requirements for helicopters at high density terminal areas because of the lower maneuvering speeds and the ability to execute steeper descents than with conventional airplanes.

From the military standpoint there is a definite requirement to develop an all-weather capability to accomplish routine instrument approaches to landing at heliports as well as newly established front line landing areas. Slower maneuvering speed and steeper descent capability would permit approaches to be made closer to a protected landing site. Problems associated with surrounding obstructions or terrain hinderances could be more easily avoided or eliminated.

Since the development of helicopters capable of instrument flying, all approach procedures used are designed for fixed wing aircraft: basically shallow approaches and high airspeed on final. Helicopters can and do use steep angle approaches under visual flight conditions. Why must we restrict the approach angle while in instrument conditions? Major changes in terminal procedures to a separate helicopter instrument approach criteria would provide all-weather capability to almost any landing site.

IFR criteria oriented to fixed wing performance fail to exploit rotary wing performance capability, and they impose unwarranted restrictions on the development of helicopter IFR procedure. In practice, the helicopter operating under IFR in a predominately fixed wing environment is regarded as a trespasser by the established user. On IFR routes the helicopter's slow operating speed fouls up traffic separation. At high activity terminals, delays result for the same reason. The helicopter is sandwiched in between fixed wing aircraft that cannot slow down nor divert from standard procedures for various reasons.

To formulate criteria permitting maximum use of available airspace within the performance capabilities of rotary wing aircraft would create no special problems. Such criteria would permit increased flexibility in IFR routing, reduce problems in separating rotary wing and fixed wing aircraft, and result in savings of time and distance for helicopter IFR operations.

Changing approach procedures to what helicopters need is easily accomplished in a tactical environment. Using the mobile GCA unit and increasing the glide slope from the conventional 3° to 8° reduces airspace requirement for descent and approach significantly by limiting the flight path to the minimum essential ground distance. Using this system, helicopter instrument flight is possi-

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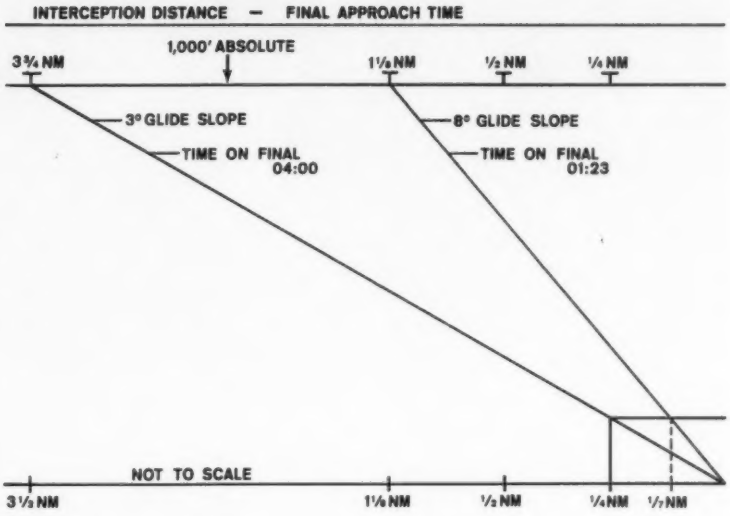
ble into and out of areas of limited dimensions and where terrain or obstructions preclude normal operations. Steep angle GCA would provide the following advantages:

- Better use of the inherent characteristics and capability of rotary wing aircraft to reduce airspeed and increase rate of descent as required.
- Obstruction clearance would be obtained by increasing the glide slope rather than by removing obstructions along the approach course.
- As the glide slope is increased the time and distance on final approach is decreased proportionately.
- With the reduced time on final more aircraft can be landed in a specific time block.
- Assuming aircraft are vulnerable to enemy ground fire only during visual flight, exposure time and distance are decreased proportionately.

To implement the 8° glide slope as standard would create no additional problems other than those presently associated with the conventional 3° ground controlled approach. Approach angles above 8° are beyond the present capability of helicopter instrumentation, since all instruments installed in helicopters today are hand-me-down from fixed wing instrument requirements. Normal GCA techniques are employed to execute the 8° approach; therefore, no additional training for the pilot or ground controller is required.

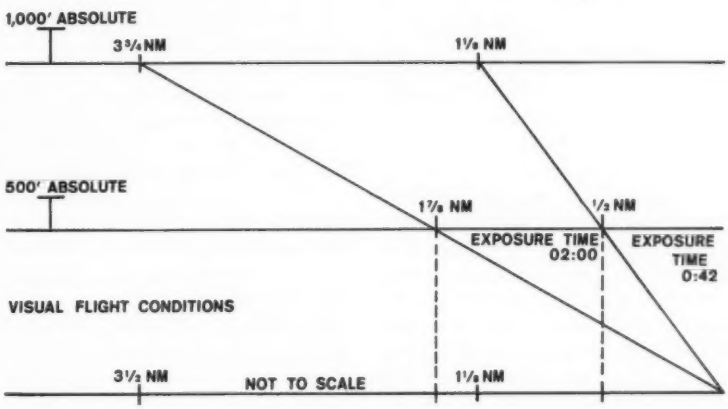
Note: FAA flight check personnel have certified the 8° approach at Hanchey AAF for IFR training for all rotary wing aircraft. Research is being continued to see if this is the optimum or whether the approach should be at a higher or lower angle of descent in varied meteorological conditions.



1. NORMAL RATE OF DESCENT
   3° = 350 FPM 8° = 650 FPM
2. AIR SPEED ON THE 8° APPROACH SHOULD BE 60 KTS TO AVOID EXCESSIVE RATE OF DESCENT
3. GCA MIN 3° APPROACH 100 FEET AND ¼ MILE VISIBILITY
   8° APPROACH 100 FEET AND ⅐ MILE VISIBILITY

Figure 1

Figure 2



1. CEILING 500' ABSOLUTE
2. 3° VFR TIME AND DISTANCE TO TOUCHDOWN
   01:48 1⅞ NM
3. 8° VFR TIME AND DISTANCE TO TOUCHDOWN
   00:42 ½ NM

THUNDERSTORMS: *widely scattered*

Captain Ronald L. Vaughn

IT WAS NIGHT. In the summer, darkness falls with a thud upon South Carolina. It wraps the woods in black velvet. The birds are quiet, streams slow in their running, and the stillness becomes a living presence.

Jim Cantry and I were in the maneuver operations tent getting a briefing on our mission for the night. We were to fly our Mohawk up to Wadesboro and search the area for "enemy" troop concentrations. When the G-2 representative finished with us, Claude Davis, the assistant op officer, gave us our weather briefing.

"Weather the rest of the night looks pretty good. Ceiling 8,000 broken, visibility 5 miles in light haze, surface wind light and variable. Should stay that way all night. You birds have a good flight."

We took some final sips of coffee from our steaming canteen cups, grabbed our gear and started to leave. Just as we opened the tent flap, Claude called to us.

"Oh by the way, Major Wilson [our op officer] said be sure to tell you there'll be widely scattered thunderstorms in the general area tonight."

Jim gave me a look of "So what else is new?" We headed for our waiting bird.

We walked through an ocean of ink. You could count the stars on one hand and have fingers left over for the moon—which wasn't up yet. Walking toward our plane, we both noted the wet iron smell of rain on the way. The dampness in the air muffled sounds and heightened smells. Wild garlic growing on the parking apron banged our nostrils with it pungency. Crewchiefs working around the area had the volume turned down on their voices.

"She's all ready to go, sir." Carson, our crewchief, stood by the pilot's hatch, holding my seat harness like a new overcoat he was trying to sell. He was a fine crewchief, but he couldn't stay above the rank of PFC. He was too frank.

"You think this hunk of iron will get us off the ground tonight, Carson?" I said.

"If you let her . . . sir." He said it with a smile, I think.

Jim and I climbed into the cockpit, strapped in, and ran through the prestart. The turbines lit off nice and cool. Jim flicked on the commo radios, and

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A giant grabbed us by the tail

called the tower for takeoff. I turned on the nav radios. When the ADF rushed on, I noticed short bursts of static mingled with the background noise. I thought nothing of it.

Flaps down, seat armed, hatch locked, props max, power stabilized. Ready for takeoff. Full power—the Hawk whined into the night sky. As we climbed over the tall pines, Jim pointed toward the northwest. Several miles away, a thunderstorm flickered on and off.

"We're gonna get a wet airplane." Jim said.

"Not from that thunderbumper, I hope." I didn't like the looks of the cloud-to-cloud lightning. But it was a long way off, never get to us tonight. The ADF sputtered.

We arrived over the town of Wadesboro, S. C., at 2,500 feet. It was around 2230 when we started our search pattern, heading east and west. We were going to look around for an hour and a half. We were all set up; the air was smooth. I turned on the autopilot, lit a smoke, and sat back to relax. We had been up for about an hour when it happened.

It got so dark, so fast I thought I'd gone blind. I guess the cloud sneaked up on us from the north, but wherever it came from, we were in it solid. A giant grabbed us by the tail and slammed us into a solid gushing wall of water. The instrument panel tried to spring into my lap. The stick tried slapping me on both knees at the same time with a bash in the gut in between. I reduced power. It didn't help. The airspeed indicator got tired and took a rest, the vertical velocity nervously chattered between pegs. The artificial horizon looked like a striped ball rolling downhill. As our seat belts strained to keep us from going into orbit, things started to get bad. Boss Lightning had arrived on the scene.

You know those experts who say lightning won't hurt an aircraft? Well, I wish they had been in my seat that night and I'd been at their desks where they found it out. The short hairs on my neck stood at a rigid attention. I could have driven them in with a hammer. The plexiglass above our heads turned a crackling shade of blue as Saint Elmo danced with us. The flashes in front and around us were utter whiteness.

The giant let us go almost as abruptly as he had grabbed us. We were regurgitated from his side at about 8,000 feet in a steep bank, steep dive, with no control pressure. That Grumman Iron Hussey was still in one piece though; she just needed something that resembled a pilot at the controls. I was able to pull out of the unusual attitude with a minimum of skill and a maximum of violent oaths. I had sweat gallons. Most of it was in my eyes, my soggy gloves, and my crotch. For some reason I itched all over. We finally got straight and level and watched Mr. Storm walk boldly away on his spindly white legs. The thunder sounded like laughter.

"Tried to kill us!" Jim said with a whew.

"Sure did. You OK?" I asked, noting that I was still in one piece.

"I guess so, but if I was a cat, I'd say I only had 8 of them lives left."

"Me too. I wonder how many rivets we've got left out of a billion." I tried to clear the dank smell of fear from the cockpit.

"Well, we still got two . . . the wings are on."

I tried to smile, but my eyes wouldn't squint. Since the damage to the aircraft was an unknown quantity, we thought it best to call out the crash trucks back at the field. We didn't want to take any more chances this night. Jim called the airfield and told them we had been caught by a thunderstorm and banged around a bit and maybe the airship would fall apart as soon as it touched the ground. He asked them in the most calmly professional voice he could muster to have the crash truck stand by—if they had nothing else to do. I wanted to order a shot of Scotch (neat) to be ready for me, but I thought twice and didn't.

The Hawk stayed together on landing. We were on the ground, alive. After shutdown we went over to operations to report the whole story and ask the Good Major what he meant by, "widely scattered thunderstorms."

Major Bill Wilson was a slow talking, slow listening Georgia boy. He was tall as a flag pole and looked like he was made of Tinker Toys. He was sitting at his desk, size 13 feet crossed, bony fingers laced behind his head.

"Wahl, genelmen, I heah ya'll had a liddle trouble. Whut happened?"

We told him the whole story. At the end, we raised a fuss about the weather forecast. "Widely scattered," we said. "There was one right on top of us."

Wilson gazed up at the dusty canvas ceiling, ruminating his Day's Work chaw. He thought long enough to plan World War III. Finally, he fired a bullet-like gob at his tin can spittoon. He stood all the way up and bent his back in the wrong direction. It made a loud crack.

"Wahl, ya'll only hit one didn'ya?"

Jim looked at me to see if I was going to have a fast answer. I looked at him to see what he was going to say. Then we both walked out of the operations tent, quietly into the darkness.

YOU'RE THE PILOT—

What Are Your Limitations?

Lieutenant Colonel Robert H. Williams

YES, YOU ARE THE pilot, but do you know your limitations when it comes to flying? No matter how good you are—or how good you think you are—you are not infallible; no human is. And whether you are a fledgling or a master, constant vigilance is necessary if you are to fly safely, for both humans and equipment have limitations.

The first steps in learning to fly are generally mechanical, and it is not until the pilot gains several hundred hours experience that flying begins to seem natural. Unfortunately, this feeling sometimes turns into complacency, carelessness, and ultimately into accidents.

It is true that experience is a teacher—sometimes the best teacher—but it does little good to you as a fatality. One can fly below bridges and telephone wires, between trees, buzz favorite targets, and do all sorts of aerobatics. And some are luckier in these exploits than others. Just because one pilot has had the training and experience required to accomplish a certain mission doesn't mean that you have that capability—even though you might be lucky a few times.

In Japan several years ago an Army Aviator got by with some actual instrument flying without ever having attended a formal course of instrument instruction. This particular pilot would fly

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south toward Tokyo above the cloud layer, orient himself on Mt Fujiyama, and without a clearance of any type for an instrument letdown procedure, take up a heading for Tokyo Bay and descend en route. He always broke out of the overcast over the water and returned to his destination.

The division to which this "expert" instrument aviator was assigned returned to Korea. After a few months in Korea, this aviator, two other Army Aviators, and the chief of staff of the division were returning to Japan. After flying to the Tokyo area and sighting Mt Fujiyama late in the evening, the aviator began an instrument letdown. The flight came to a sudden stop 80 feet below a mountain ridge.

This man did not realize his limitations—which cost his life and that of three others. Accidents don't just happen—they're caused; and you, as the master of your own craft who plans and makes the flight, are the primary cause of all aircraft accidents.

Aircraft of today are put together considerably better than

He flew into the side of Mt Fujiyama

they were 50-odd years ago, but even today aircraft have their limitations, and these you as the pilot must be aware of. Each aircraft is designed within certain specifications which determine what that aircraft is capable of performing. If you push the aircraft beyond its limitations, then you exceed its safety factors.

Army aircraft are not designed to penetrate thunderstorms. On a flight in a U-6A between Cincinnati, Ohio, and Charleston, W. Va., the weather was reported IFR at 7,000 feet with scattered showers—no reported thunderstorms. About one hour en route and under AI conditions at 7,000 feet, the rain kept getting heavier and it was very dark, with moderate turbulence. All of a sudden the rate of climb indicator showed the Beaver going up 2,000 feet per minute—and without power. At 9,000 feet the bottom fell out and with maximum power the descent was 2,000 feet per minute—and the aircraft was at 7,000 feet again. This heavy turbulence lasted another 10 minutes. By lolling along and rolling with the punches, and holding a heading as close as possible, the area was cleared and reported to the nearest FAA radio.

The best way to beat thunderstorms is to stay clear of them. You might not be as lucky as these U-6 pilots were.

Another bit of advice is to stay oriented in the air at all times and to know precisely where you are. Two Army Aviators were flying IFR, on top, from Fort Bragg, N. C., to Fort Rucker, Ala. It was a beautiful, smooth flight at 8,500 feet—no clouds above but a solid layer below. The copilot was navigating and knew his exact position in relation to the ground when the engine began to sputter and suddenly quit. Changing fuel tanks and restarting procedures were ineffective. The copilot advised the pilot to begin a slow left turn (there was no problem to descend). At approximately

After orienting on Mt Fujiyama, he would descend through the clouds without a clearance of any kind

What Are Your Limitations?

7,000 feet the layer of clouds was entered and when a heading of 100° was reached, the copilot advised the pilot to hold that heading. At 2,500 feet the aircraft broke out of the overcast—and there it was, directly to the right front, the Fort Gordon airfield. Augusta had been passed a few minutes earlier but was much too far away to attempt a glide.

You may never have an engine failure in flight but the odds are pretty good that you will, even though our aircraft are becoming more reliable as science and technology advance.

Not only must the aviator be aware of his training limitations and the limitations of his aircraft, but he must also be constantly concerned with his physical and mental limits. Good physical and mental health are primary requisites for the aviator, and throughout his career he must be vigilant in keeping himself in top condition.

And even the best conditioned pilot can suffer from fatigue, which is sometimes difficult to recognize. An aviator who puts in a 5 or 6 hour day flying, the majority of which is IFR, will not be nearly as proficient at the end of the flying period as he was at the beginning. For instance, an IFR approach made within the first 2 or 3 hours flying is generally much more accurate than another approach of the same type at the fifth or sixth hour of flying. Notice it if you have the chance, but don't get in over your head.

Another point the professional aviator is concerned with is that old everyday term "courtesy." As the master of your aircraft you do not have the authority or privilege to abuse the rights and well being of other aviators or passengers in the immediate area. Take your place in traffic patterns and respect the position of others in the same pattern. Plan your landing so that you can safely turn off on the nearest exit taxiway.

Helicopters must practice a steady descent and move rapidly to their parking position and not cause blowing dust or excess wind velocities to interfere with personnel or other aircraft. This also applies to starting, taxiing, or hovering any aircraft. Always make sure the area is clear, well clear, of personnel or other aircraft which might be affected by prop blast, rotor wash, or blowing dust. Remember that courtesy in flying in most cases has a direct bearing on safety—both in the air and on the ground.

You have been taught the finer points of flying and the correct use of navigational aids. You are a part of the Army aviation team, with the capability of being professional in every sense of the word. But to become professional you must know your limitations and not exceed them. Always fly the aircraft; never let it fly you. Learn all you can from others. Never put yourself in the position of already knowing everything—you are never too old to learn. Maintain your professional standards at all times. Do not take chances; know what you are doing.

The future of Army aviation depends upon the Army Aviator's achieving and maintaining the highest standards. Knowing your limitations and the limitations of the aircraft you are flying—and not exceeding them—will contribute immeasurably to the goals of Army aviation.

I departed Cincinnati ahead of the rainshowers, but heading into building weather

PROGRESS

What is new is the use of separate systems and devices rather than whole aircraft during portions of organizational maintenance training at Fort Rucker.

Lieutenant Colonel Clifford S. Athey

UNIQUE IS perhaps the most accurate description of a recently initiated UH-1 (67N20) mechanic training program at the U. S. Army Aviation School. The program is unique from the standpoint that it has changed the thinking and planning for training all Army organizational aircraft mechanics. Let us call it the concept of training aircraft mechanics through the increased use of aircraft systems and devices and a decreased use of the whole aircraft. Sound new? It really isn't, but complete implementation across the board and in depth is new.

The concept is not new because the U. S. Army Aviation School, as well as all other service schools, uses various parts, components, and devices during part of every course as a supplement to use of the end item (aircraft). What is new is the use of separate systems and devices rather than the whole aircraft during portions of the course, thereby reducing the requirement for expensive whole aircraft. A reduction in training aircraft required obviously will release that number of aircraft to fill shortages in tactical units.

The next question you may ask is, "If we can release some of

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these quarter million dollar machines by such a concept and the concept is not new, why then wasn't it done a long time ago?" Before FY 1966, the answer most often given was in three parts:

That's the way it has always been done, therefore it must be the best way.

Special training devices require long lead time to build or procure.

Fluctuations in training load, especially rapid buildups, preclude getting additional aids/devices, yet the aircraft are in the system and are relatively easy to acquire.

During mid-July 1965 the U. S. Army Aviation School received, as a result of commitments to Vietnam, the first of several increases in the programmed mechanic student inputs. These increases were such that within nine months the in-resident load of students doubled and the maintenance training aircraft fleet almost doubled. When you consider that this fleet was composed of from 2 to 40 each of every aircraft in the Active Army inventory, with the exception of the CH-47, it is easy to visualize the high value, in dollars alone, tied up just for mechanic training.

The Director, Department of Maintenance Training, had always felt that just because "that was the way we had always done it" did not necessarily mean it was the best way. He became extremely concerned over the large number of aircraft required for nonflying duty while other units and installations were being stripped. The Assistant Commandant was also concerned and directed that a group be formed and a study made to determine if there was in fact a better and/or less expensive way to produce qualified mechanics. The group was to consist of 1 officer and 3 civilian education specialists from DOMT and an officer each from the Director of Instruction and Director of School Support.

The group outlined the study, planned a series of visits to civilian schools, the Air Force Technical Training School at Shepherd Air Force Base, and the Naval Air Technical Training Center at Memphis Naval Air Station. All of these institutions were contacted, objectives of the visit explained, and permission for visits obtained. During October and early November the group in whole or in part visited six mechanic producing institutions. In every instance, the schools showed cordiality, hospitality, and interest in the project.

To make a long story short, all of the schools used generally the same types of training aids/devices. Differences were primarily in the degree or extent to which these aids/devices were used. The most startling difference was that the Army (aviation and transportation schools) is the only one which deliberately uses whole modern aircraft during mechanic training.

The study group's final conclusion was that the number of aircraft required to support mechanic training could be materially reduced provided systems, devices, and components in sufficient numbers were substituted therefor, and that a test should be conducted to determine the validity of the concept. As part of the study, an analysis was made of the UH-1 Program of Instruction, and substitutions were made wherever they appeared feasible. The unsupported results indicated that as much as a 50 percent reduction in aircraft could be realized.

When these results were presented to the Commandant, the Department of Maintenance Training was directed to test the concept as soon as possible. December 1965 through February 1966 were spent in writing new lesson plans, acquiring parts and constructing several new training devices. These new ones, with what were already on hand, provided the vehicle for testing the concept on three successive classes. Random selection of 7 students from each class provided a test group, with the remainder of the class acting as a control group at the same level of training.

Final examinations were completed on 1 April 1966 and evaluation of the test program began. In addition to the classes which furnished the test groups, examination results from three previous classes were selected to enlarge the control base. Achievement was determined by using raw scores obtained on the examinations. The test and evaluation team reported: "The achievement of the test group as shown by average raw score on tests 2, 3, and 4 in the 67N Course is not significantly different from achievement by the control groups." The study, to include test results, was then completed and forwarded to CG, USCONARC, for final approval. In the meantime, the Department of Maintenance Training was directed to take immediate action to implement as much of this "new" concept as facilities and equipment would permit.

One method used by the department during and immediately following the study was to derive training systems and devices from the aircraft themselves. By disassembling aircraft into their major components, groups of students using that aircraft increased

from one to as many as three or four. For example, the UH-1 breaks down nicely into four major assemblies, yet support maintenance can easily restore it to a flyable configuration if such is later required.

During the entire period of the study and test, and as the result of the increased requirements to produce mechanics, Department of Maintenance Training was also considering several other innovations which might reduce training time, equipment, and facilities requirements, yet continue to produce a well qualified mechanic. The most fruitful of these was the elimination of the Intermediate Observation Helicopter Course (5 weeks) as a prerequisite for entry into the MOS 67N20 (UH-1) Course by adding only two weeks to the UH-1 training.

A saving of over 200 man years of training time was realized over the remainder of the year and a new concept titled "direct flow" was born. It worked so well that action was taken to study all courses for the feasibility of elimination of prerequisite courses. It is expected that by 4th Quarter FY 67 all mechanic courses which now have an intermediate prerequisite course will be revised to eliminate the prerequisite course.

One other method devised to allow for an increase in students without a corresponding increase in training aids, equipment, or facilities is the "daily flow." If annual student input requirements are relatively small, starting a class once a week, two weeks or month is satisfactory. However, when input doubles or triples, facilities and equipment must increase accordingly simply because a larger number of students are receiving the same block of instruction at the same time.

If classes start 8 hours apart (daily), and as much instruction as possible is prepared in 4, 6, or 8 hour blocks, a substantial increase in the number of students can be realized without a corresponding increase in equipment. Those blocks of instruction exceeding 8 hours will require some increase in facilities and equipment as student input grows, but still not to be the extent required by previous programs.

We now have the third big change in the USAAVNS concept, methods and procedures for producing organizational aircraft mechanics, each of which tends to reduce the cost (time, personnel, facilities, and equipment) of training. Put them all together and count the savings, observe the efficiency with which the system works, and total up the utilization of classrooms and equipment. In some instances the *increase* in use of classrooms and equipment exceeded 150 percent. Compare the present graduate with a former graduate and you will find that he has actually learned more than his predecessor.

Let me list some actual figures of the number of aircraft saved by these changes:

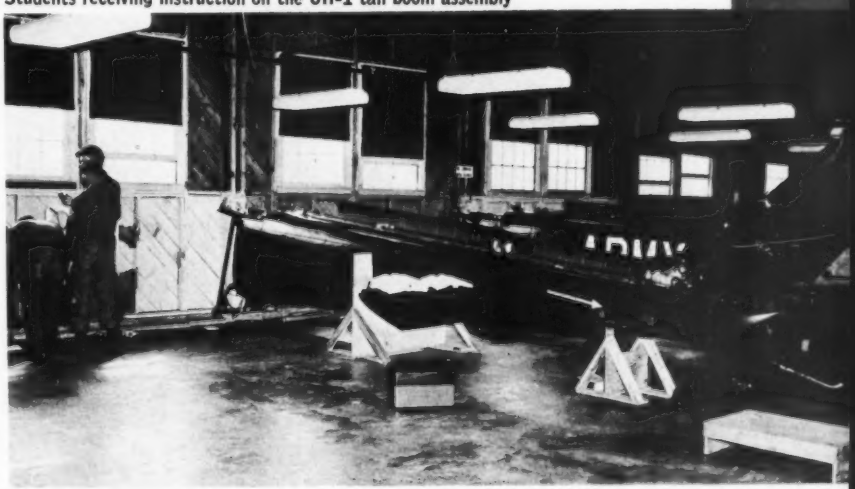
UH-1	Reduced from 41 to 30
O-1A	Reduced from 16 to 6
U-6A	Reduced from 22 to 7

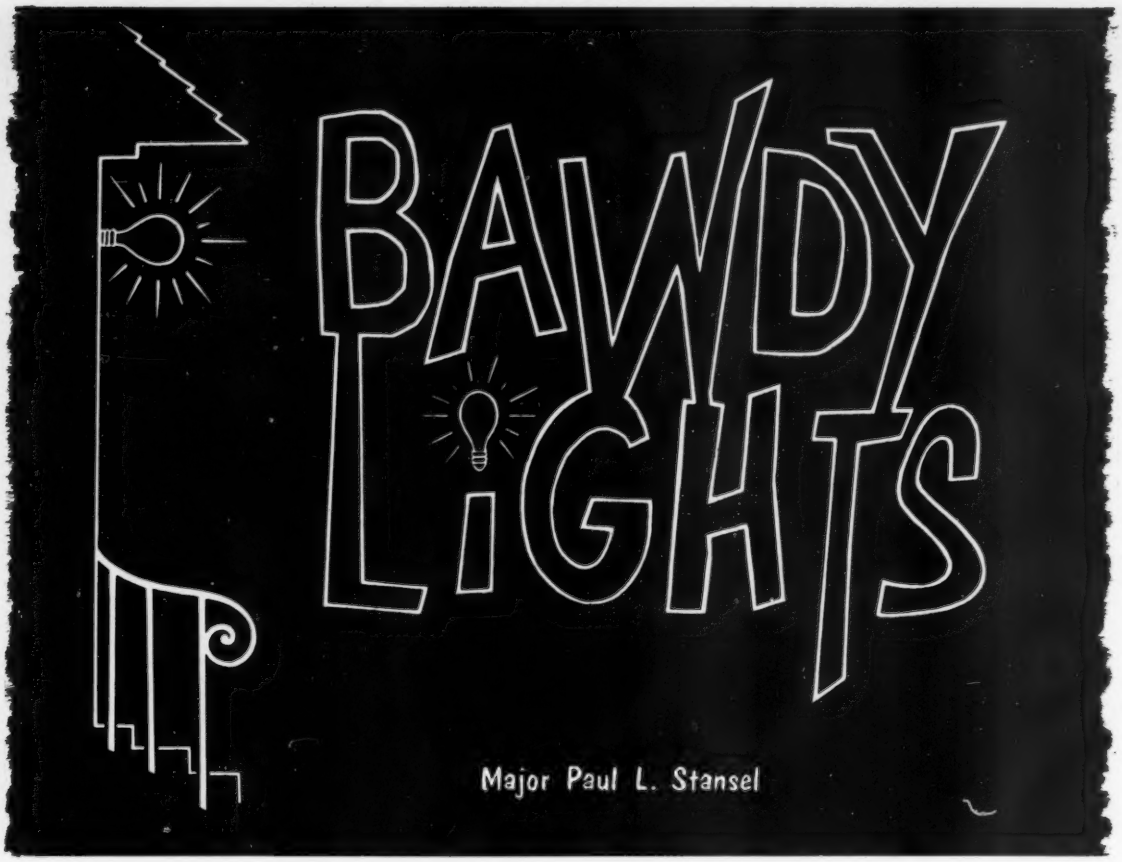
As the other programs are converted, savings will occur in all aircraft (for any given number of students that is).

Considerable interest has been generated at all levels of command by these innovations. The enthusiasm of the instructors and acceptance by the students is also very gratifying.

The Department of Maintenance Training and the Army Aviation School are well aware of and deeply concerned with the assigned mission of training organizational aircraft mechanics for the U. S. Army and constantly strive to improve the product. Any idea presented, method developed or innovation suggested will be carefully studied and, if promising, will be tested and/or included in revisions to the programs of instruction. In this way progress is assured.

Students receiving instruction on the UH-1 tail boom assembly



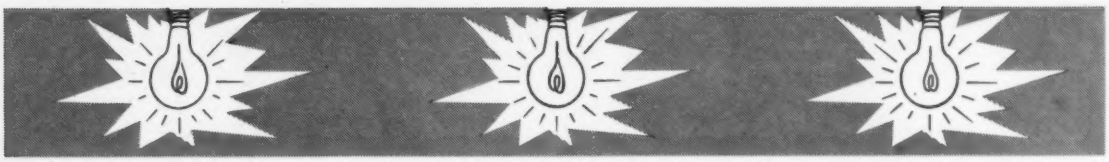


. . . some aviators have come to place more reliance in a red light advertising coming events than in proper planning to prevent these events.

WHEN TOM EDISON pushed the switch that illuminated the world's first electric light bulb, I bet he never would have guessed the way some folks would come to depend on his invention. It's amazing what folks expect from a little light bulb. It's supposed to illuminate, advertise, indicate and remind, all in one. This situation causes some strange reactions at times, and when the bulb fails to light, causes some equally strange lack of reactions.

The biggest reaction I've ever seen to a single light was caused by a color-blind janitor placing a red bulb in the porch light of the WCTU meeting hall in my home town. Sadie Bligh, head of the entertainment committee, was right in the middle of a stirring love ballard titled "Lips That Touch Wine Shall Never Touch Mine" when a truck load of itinerant kumquat pickers armed with a crock jug of Panther Pilcher stormed into the hall looking for action. The resulting riot caused more damage than Phil Sherman's earlier march through town en route to a Yankee veterans con-

MAJ Stansel was assigned to the 10th Aviation Group, Ft Benning, Ga., when he wrote this article.



vention at Jekyll Island.

Like the unfortunate kumquat pickers, some aviators have come to place more reliance in a red light advertising coming events than in proper planning to prevent these events. This is particularly true in the matter of proper fuel management.

How many times have you heard (or said), "So I kept it feeding from the center tank until the warning light came on, then I . . . etc." It's a common statement to be heard where flying stories are being told. I like to refer to this as the "Joe Dumb system of fuel management." This system is especially effective when combined with the "hidden gauge" system of aircraft design employed in some Army aircraft.

In the past five years over 80 Army aircraft of various types ran out of fuel in flight. Of these dry throated gliders, 40 became perpetual earthbound monuments attesting to the brilliance of combining these two systems. I wonder how many Joe Dumbs were just sitting there "feeding from the center tank until the warning light came on . . ." when disaster struck.

Design of the O-1 aircraft blends well with this combination. Fuel quantity gauges are located within easy vision range of the pilot—if you happen to watch the aircraft wing roots as you fly— and the complicated and highly technical job of installing a simple warning light was eliminated from the design by some unknown disciple of cost reduction worshipping at the altar of false economy. The results of this combination are that the O-1D and O-1F models of this basic aircraft lead the pack in number of fuel exhaustion cases. The Joe Dumb system of fuel management will not work without a warning light to trigger action.

The U-6 works well with the Joe Dumb system but it also has a few design shortcomings. Did you ever try to check the tip tanks just before takeoff? After an extensive unsuccessful scavenger hunt for a ladder and a bone jarring tumble from a one-footed balancing act on a wheel chock, I'm sure you stumbled on the generally accepted method—the run, jump and watermelon thump! Not very accurate, but then again neither is the confusing set of double-numbered, eye straining clusters located on the instrument panel for the regular tanks. To compensate for these minor shortcomings, Saint de Havilland installed Joe Dumb's old standby, the beady eyed little red light. After it illuminated, Joe has 5 whole seconds to take action before the engine quits. If Joe happens to be preoccupied, he's liable to frighten his passengers (perhaps his rating officer among them) or risk a vapor lock rendering further power sustained flight highly improbable.

The U-8 was designed as prime transport for the Army's highest brass, yet has the same fuel warning devices as the O-1—NONE! Again the "hidden gauge" system of design was employed with great effectiveness. Lacking room to install the fuel panel on the instrument panel due to installation of seldom used circuit breakers, ash trays and so forth, the designer cleverly concealed it under the pilot's left arm pit, being careful not to install a warning system that would draw attention to it under any circumstances. If enough Key Klub members use the "Joe Dumb" system, promotions to the top could be faster in the future.

How can future fuel exhaustion cases be prevented? Problems of design were cured in the CH-47. Everything is up front, readable, and easy to understand. Now if we could modify Joe's mental design to think ahead a little, we'd have it made. Perhaps we could borrow an idea from the auto dealers and install a tape recorder with appropriate messages. Approximately 30 minutes from fuel exhaustion time Joe would hear, "This is the voice of your friendly accident board president, Lieutenant Colonel Hangum. If you don't take appropriate action to switch tanks or replenish your fuel supply within the next 30 minutes, you shall be talking to me in person—maybe!"

If Joe failed to get the first message, the second would be even more drastic. "This is the recorded voice of Colonel Pennypincher, your flint-hearted, tightfisted finance officer. In exactly 15 minutes your flight pay will terminate unless you replenish your fuel supply!" This second message would be recorded against a background of whimpering, candy-starved kids, and a wailing wife bemoaning the necessity of wearing last month's gown to this month's party.

If both these messages fail to cause Joe to take action, and to perform adequate preflight planning, then I guess we'll just have to sic the WCTU ladies on him. They sure cured the kumquat picker's reliance on red lights.

Little mistakes don't hurt us too much; it's the big mistakes that break our backs and kill us.

The Two Mistakes

Lieutenant Colonel Richard L. Dismuke

AN AESOP'S FABLE chronicles the events transpiring as a result of a hunt conducted by a lion, donkey, and fox. This unlikely trio was very successful during the hunt and returned laden with a great bag of game. Only one problem remained, how to share the game. With little discussion the lion directed the donkey to divide the game now lying in a great pile. The donkey soon divided the game into three equal heaps, indicating each hunter would take one of these as his share.

This mathematical precision enraged the lion. He roared his disdain, fell upon the donkey and killed him on the spot. Still roaring and grumbling the lion threw all the game into one pile, including the deceased donkey. Turning to the fox the lion said, "You divide it." The fox quickly and deftly removed one small field mouse and allowed as to how the field mouse was his share and the remainder was the lion's. This action greatly pleased the lion. In fact he was so pleased he exclaimed, "Wonderful! Wonderful! How on earth did you learn to divide so well, Mr. Fox?" The fox replied, "I learned from the donkey, Mr. Lion."

Obviously this story gave rise to the expression "The lion's share." The moral of this story is equally obvious: it is a wise person who learns from the mistakes committed by others. What isn't so obvious is that this story clearly identifies two mistakes. One is of a staggering magnitude and the other rather inconsequential. While the mathematics of the donkey's action was correct the results were disastrous, a BIG mistake in psychology, a fatal mistake. The fox, whose math left him on the short end of the stick gamewise, made a coup in psychology which left him sound to return for another day's hunt. His mathematical mistake was little, all things considered, a small thing. Thus, mistakes come in two categories, the big ones and the little ones. Little mistakes don't hurt us too much; IT IS THE BIG MISTAKES THAT BREAK OUR BACKS AND KILL US.

Surely, every military individual who takes the field has one thought in mind: to be successful, to win. Nonetheless, in this game someone must lose, and history parades before us the losers of battles as well as the winners. But why do the winners win and the losers lose? The winners didn't win because they were perfect, absolutely flawless, for history shows that every commander in the field makes mistakes, both winners and losers. The significant

"I learned from the donkey, Mr. Lion"

revelation of history is that the commander who won the day is the one who made the fewest mistakes and those mistakes of least magnitude. Therefore, I can conclude that to be consistently in the win column, all I need is a scheme whereby I can eliminate the BIG mistakes and reduce the little mistakes to a minimum.

What then is this scheme, if there be such a method? First, let us look at the actions of a military leader confronted with a mission. He is schooled to plan his operation based upon the best information available. This information is usually in terms of enemy capability and disposition, military aspects of the terrain and weather, and his own troops and equipment. Examination of this information as it pertains to the mission will reveal several courses of action available to the leader to attain the objective.

Now, the leader is confronted with a choice. He must judge the relative merits of each course and base his selection on some rationale. More often than not this reason is economy; that is, get the mostest for the leastest. You couldn't devise a more sensible or logical approach. Heaven help us if we stop at this point; we have only considered one side of the coin!

We are not playing heads I win, tails you lose. The point I would like to make is this: while each course of action could be successful, it could also be a failure (mistake). I contend that the prudent leader and the one who emerges in the win column will examine each course of action as failure

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Why do the winners win?

just as closely as he considers it a success. This leader must ask and find the answers to some soul-searching questions.

If for some unforeseen event, providential or otherwise, this course of action fails then what kind of price am I going to pay, literally speaking, for nothing? Will the effect of my mistake be disastrously fatal to my forces or will it allow me the ability to readjust to effectiveness? Will I emerge destroyed or relatively whole to do the foe in before the final dust settles? No matter which course of action I select, if it be successful the payoff is the same: a success. Not so the cost of failure; however, I can plan and place an acceptable ceiling to the costs incurred as a result of failure in the same manner as I place an acceptable cost in the purchase of an objective (success). I have deliberately selected a course of action that will succeed according to plan, but is the least mistake if the plan goes astray. I have eliminated the BIG MISTAKE.

The Zero Defects Program, I believe, has a close kinship to this vein of thinking. Both honestly recognize the frailty and fallibility of the human being. Each provides an atmosphere to encourage an acute awareness of the errors, mistakes, and failures confronting us from time to time. Both understand human beings can avoid more easily those things they are aware of and alert to, and can thereby minimize in number and magnitude the mistakes committed or exposed to. Each realizes the planned event can be handled better than the unplanned to include mistakes as well as successes.

This philosophy is particularly applicable to the aviation business. We in Army aviation are armed with all sorts of facts, information, and knowledge gathered over the year from our predecessors, contemporaries, and some firsthand by our own experience. To illustrate I shall list a few:

• Aircraft systems fail from time to time.

• An aviator who spends a lifetime in the flying business will experience one or more of these failures.

• A tactician who forces the enemy to fight on the ground of the tactician's choosing will bag the enemy every time.

Takeoff may be accomplished by several methods (courses of action). Let's examine two. Pilot A is to fly a U-6 at maximum gross weight from Cairns AAF to Fort Stewart, Ga. Pilot A is cleared to runway 06, but requests an intersection takeoff. When ready he is cleared for intersection takeoff runway 06. Pilot A takes the run-

The fox is left on the short end of the stick gamewise, but scored a coup in psychology and . . .

way and applies power, using approximately 4 inches less than takeoff manifold pressure. The aircraft lifts off in the last 20 feet of runway 06 at stall speed. Pilot A gradually accelerates and climbs away on course.

Pilot B has the same type mission, aircraft and destination. He is cleared to runway 06 and taxis to the approach end and calls for the runway at the completion of his before takeoff check. Pilot B takes the runway and applies full takeoff power. Pilot B lifts off at the intersection a few knots above stall speed and crosses the end of runway 06 at altitude 200 feet and climbing airspeed. Pilot B consumed more time and fuel taxiing. He may have exposed his engine to more wear.

Were these mistakes on part of Pilot B? When you consider Pilot A and B achieved the same, identical thing (a successful takeoff) you could say these were mistakes on the part of Pilot B. He paid a little more for the takeoff.

Be the master of your destiny

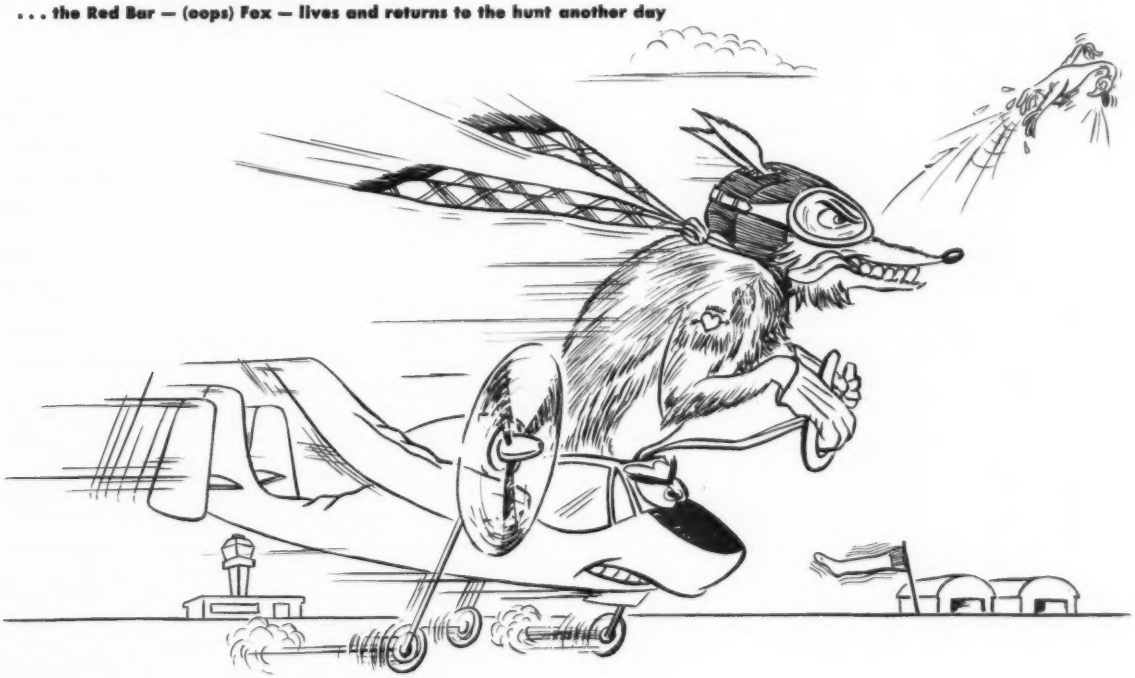
Let's assume for the purpose of this illustration Pilot B's engine failed at liftoff. He allowed his aircraft to settle back to the runway, landed, and braked to a stop. He called the tower for a tow back to the line and requested a backup aircraft to finish the mission.

Pilot A just after liftoff experienced a similar failure, but in his case the aircraft settled into the heavy structures housing ILS componets. The aircraft cartwheeled, breaking into pieces, and burst into flames. The heroic efforts of Flatiron and other crash rescue men were to no avail; there were no survivors.

There is little doubt who committed the BIG MISTAKE. It may be a little mistake on the part of Pilot B to operate his aircraft in such a manner as to force any failure to come in a condition of his own choosing. This is a little mistake so long as there is no failure, but once the failure occurs it removes any thought that a mistake was committed by Pilot B. The difference between disaster and being able to return to the mission was the course of action selected to accomplish takeoff. Both methods were capable of achieving the objective providing events occurred as planned. Pilot A failed to examine the other side of the coin.

If you consider yourself a professional in this business of flying and wish to spend a lifetime in it, a long lifetime, then to a great extent you must be the master of your destiny. The fulfillment of this wish depends largely upon your choice. Which will you choose? The BIG MISTAKE or the little ones?

. . . the Red Bar — (oops) Fox — lives and returns to the hunt another day



the following 28 pages prepared by the United States Army Board for Aviation Accident Research

LOOK BACKWARD TO "66"

Colonel Warren R. Williams, Jr.
Director, USABAAR

WHILE WE LOOK FORWARD to the chance and hope of improving our aviation safety record during 1967, let us look at the records of 1966. We may well find mistakes that we can avoid and identify areas that offer the best opportunity for improvement in 1967.

Chart I shows the Army aviation accident picture for 1966. Unfortunately, not all reports of accident boards on accidents occurring during 1966 have been received by USABAAR. Therefore, there may be some slight adjustment as to the classification and totals of these accidents.

Both the Active Army and the National Guard have made an appreciable improvement in the accident picture over the previous year when the increase in flying hours is considered. This is a tribute to the conscientious effort by all concerned with aviation operations. The greatest improvement was by the National Guard and for this they are to be congratulated.

The Army Aviation School at Fort Rucker and the Army Primary Helicopter School at Fort Wolters were faced with the problems of greatly increas-

CHART I
CY 66 WORLDWIDE ACCIDENT PICTURE

CLASSIFICATION	FIXED WING		ROTARY WING		TOTAL	
	ACTIVE	NG	ACTIVE	NG	ACTIVE	NG
MAJOR	118	8	429	25	547	33
MINOR	12	4	31	0	43	4
TOTAL	130	12	460	25	590	47
FATALITIES	41	0	158	8	199	8

CHART II
CY 66 ACCIDENTS BY CAUSE

CAUSE	FIXED WING		ROTARY WING	
	ACTIVE	NG	ACTIVE	NG
CREW ERROR	66	10	224	17
MAINTENANCE ERROR	1	1	6	1
MATERIEL DEFICIENCY	27	0	90	3

ing student loads which necessitated the use of many new instructors. Many of the rotary wing instructors had previously instructed only in fixed wing aircraft. Through special attention given by the training centers to achieving the maximum of safety without compromise of realistic training, the loss to accidents has been decreased in spite of the problems.

Aircraft accidents are seldom caused by a single factor. Recognizing this, DA no longer requires units to determine the primary cause (AR 385-40). Correction of contributing causes would frequently have precluded the situation from deteriorating to the degree that, what was frequently called, the primary cause took place. An efficient prevention program prevents both pilot and mechanics from becoming involved in situations that end in an accident.

To determine where our major effort can give maximum payoff in accident prevention, USABAAR continues to code causes involved in accidents. Chart II breaks down Army aviation accidents where causes have been identified.

The fact that crews are listed as being the cause of most of our accidents does not necessarily indicate that they are more careless or negligent than other Army personnel. The realization that aircraft accidents frequently kill or seriously injure those aboard is in itself a strong deterrent against gross carelessness or negligence on the part of the crews. Of course, there are glaring examples of exceptions in some accidents. These exceptions should be severely dealt with and individuals responsible appropriately punished.

Crew-caused accidents include many due to lack of proper training or supervision and certainly punitive action against the crewmember in this case is not justified. Crew errors also include decision errors which are made under stress, conditions of extreme fatigue, or lack of knowledge of all factors involved. When viewed from a comfortable chair and with a set of reference books to consult, it is very easy to say the crew should have taken some other action and an accident would not have occurred.

Analyses of the reports of accident boards indi-

the fact that crews are listed as being the cause of most of our accidents does not necessarily indicate that they are more careless or negligent than other Army personnel . . .

cate the following preventive actions give promise of doing the most toward decreasing our aircraft loss and personal injuries.

Pilots: Army Aviators must carefully plan and carry out each flight with the attitude that here is a chance to improve his professional skill and make a good impression. Too often flying becomes routine and no thought is given to what to do if things go wrong, until the situation becomes tense, and stress can adversely affect decisions or actions. A thorough knowledge of weather, capabilities of the aircraft, emergency procedures for the aircraft, and your own limitations are essential to avoid the "moments of stark terror" that sometime replace the joy of smooth flying. Careful attention to small details prevents the "oops, I got a wing tip" that results from what should have been an uneventful landing or movement on the ground.

Mechanics: Each mechanic must conscientiously perform his maintenance by the book and ensure that it is inspected by an inspector when required. There can be no acceptance of any but the highest standards of performance. The thought that someone was killed or maimed because you failed to do your job properly is hard to live with.

Supervisors: The exact level of deficient supervision is impossible to determine by USABAAR, but it is readily apparent to some of the others in the chain of review for an accident report. Sometimes an effort is made to disguise this, but frequently it is freely admitted. In the latter case, we can be pretty positive it will not be repeated. Most appropriate action is therefore listed for two types of supervisors:

Aviation unit commanders: You must know your pilots and mechanics. Those inclined to be careless or complacent must change or be replaced and sent to some other type of duty. Incidents of reckless or careless flying or of poor maintenance must be detected and recurrences precluded. You must ensure that your aircraft are properly maintained and operated. If your personnel are not qualified, you must qualify them. Problems which you cannot solve must be taken up at the next echelon and followed through to a solution.

Commanders with aviation elements: A personal knowledge of the situation in your aviation elements is essential. A demonstration of your personal interest in an active accident prevention program will do more than anything else to make it effective. Many aviators have a tendency to discuss their problems only with other aviators, based on a feeling of lack of interest on the part of nonaviators. Problems involving aviation personnel and materiel must be given special attention by your staff. The rapid expansion of Army aviation has resulted in routine requests being delayed or lost unless closely followed. Many incidents which are blamed on the logistical system such as nonsupply of modification work order kits, or loss of parts turned in for analysis of failure causes, result from initial failure by operational units to comply with instructions or follow up on supply requests.

A concerted effort on the part of all involved with the procurement, maintenance, and operation of our aircraft will enable the Army to continue to expand its aviation to meet its needs during 1967. Whether this is accomplished at a decrease in loss of personnel and aircraft depends on how well we make use of the lessons of the past in pushing available aviation safety programs at all levels. We can ill afford to repeat last year's mistakes.

MAIN ACCIDENT CAUSES 1966

1. Exceeding load capability of aircraft.
2. Unauthorized and unjustified low flying.
3. Inadequate lookout in air for other aircraft.
4. Starting, taxiing, or hovering with inadequate clearance.
5. Attempting to fly visually under instrument conditions.
6. Inadequate pilot checkout.
7. Maintenance by memory instead of by technical manual.
8. Inadequate inspection of maintenance.
9. Loose equipment in aircraft.

RAWF

The Case For Greater Respect For Weather

weather accidents are usually severe and very often fatal

FORECAST WEATHER: Prefrontal thunderstorms; severe weather warning in effect for proposed route.

ACCIDENT: A U-6A was cleared IFR at 9,000 feet. At 1320, the pilot gave a position report and received a severe weather warning. He elected to continue. At 1400, the Beaver entered an area of severe turbulence which caused structural failure of the wings. A witness saw parts descending from the low ceiling, followed by the fuselage. All four occupants were killed and the aircraft was destroyed.

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WEATHER: 300 foot overcast; visibility 1-1½ miles in fog.

ACCIDENT: A UH-1 departed its home field for a local flight to a nearby drop zone with a pilot, crewchief, and two passengers aboard. The helicopter was heard in the vicinity of the drop zone but was not seen. Later, the home field was notified that it had crashed, killing all aboard. The crash site was in an unpopulated mountain area that required a 2-hour climb to reach. Two witnesses, one located at an elevation below the crash site and one at an elevation above the crash site, stated there was limited or no forward visibility at the time of the accident. The pilot was not rotary wing instrument rated.

WEATHER: Low ceilings in mountainous terrain.

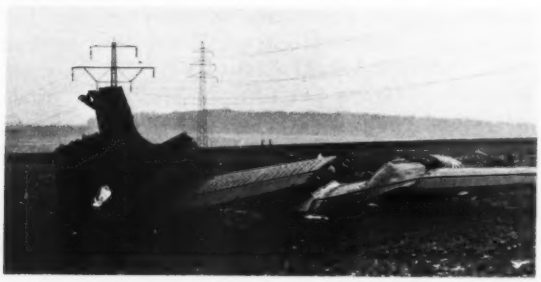
ACCIDENT: A UH-1B was one of four on a tactical troop lift mission. While positioned number 3 in a heavy echelon right formation, the helicopter was inadvertently flown into instrument flight conditions. The pilot experienced vertigo and the UH-1B made a series of turns and dives. Visual contact was made at approximately 50-100 feet and the pilot applied full cyclic. The helicopter assumed a nose high attitude, continued to descend, and crashed. The pilot was not instrument rated and had a total of 307 flying hours.

WEATHER: Multiple severe thunderstorms with moderate to heavy rain and hail.

ACCIDENT: A UH-1B was flown into a thunderstorm area witnesses described as the worst weather in 30 years, with terrible lightning and thunder. The main rotor separated and the helicopter crashed, killing both occupants. The pilot was not instrument rated. He had 1,200 flying hours.

WEATHER: Fog from ground up to approximately 150 feet.

ACCIDENT: A UH-1B lifted off to fly from one helipad to another, a distance of 300 meters. It passed to the south of the intended destination, made a 90° turn, crossed a highway, struck trees, and crashed in dense woods, killing both occupants. The pilot was not instrument rated and had a total of 269 hours.



WEATHER: Ceiling obscured; visibility 1 mile in ground fog.

ACCIDENT: A U-8F pilot, with a copilot aboard, was practicing a gyros-off GCA approach. The airplane struck high tension lines 120 feet above the ground, crashed and burned, killing both pilots. The pilot held a special fixed wing instrument rating and had more than 3,000 flying hours.

WEATHER: Snow and turbulence.

ACCIDENT: A CH-21C pilot flew into an area of blowing snow, experienced vertigo, and crashed on a glacier. All six occupants were killed. Neither the pilot nor copilot were rotary wing instrument rated. Both had approximately 700 flying hours.

WEATHER: Ground fog, haze, and exceptionally dark night.

ACCIDENT: A CH-21B pilot was on a night mission to drop supplies. He arrived over the drop zone five minutes early and decided to abort the mission when he encountered ground fog. He made

RAWF

a climbing left turn, exceeded the limitations of the attitude indicator, and spilled the gyro. Without a visible horizon or attitude indicator, the pilot became disoriented. The helicopter continued to fly in a northeast direction, gyrating along the flight path, and making a 180° turn around its vertical axis at zero airspeed. It settled rapidly. Just before impact, the pilot saw the ground rapidly approaching and applied full aft cyclic, full power, and collective. The nose of the helicopter pitched up and it settled rearward, crashing in a tail first attitude. One occupant sustained serious injuries and three escaped with minor injuries. There was no copilot aboard. The pilot was not rotary wing instrument rated and his standard fixed wing instrument rating had expired.

FORECAST WEATHER: Thunderstorms to south of flight track, rainshowers, and fog; visibility 1½ miles in rain and fog.

ACCIDENT: A UH-1B pilot was on a night ferry flight when he entered a rainshower at 2,200 feet MSL and turned right to break out of the rain. He noticed the lights on the ground growing dim and began a descent to maintain ground contact. At approximately 1,700 feet MSL, the helicopter hit the ground and bounced back into the air. The pilot continued flying, crossed a highway and attempted to keep the lights of a car on the highway in sight. He tried to make a 180° turn, entered a whiteout condition, and lost all reference to the ground. The aircraft crashed in a steep left bank, rolled over several times, and came to rest inverted. The two occupants escaped with minor injuries. The pilot was not rotary wing instrument rated. He had 1,700 flying hours.

WEATHER: 300 feet scattered, 500 feet overcast; 1 mile visibility in fog.

ACCIDENT: A UH-1B pilot was on a reconnaissance flight, with a copilot, crewchief, and five passengers aboard. He reached the first landing zone, made a low-level reconnaissance, and started to climb, planning to go to another landing zone. Because of poor visibility due to fog, he decided to return to the first landing zone and land. The pilot apparently lost altitude and airspeed too rapidly, saw telephone wires in his path, and made an abrupt control movement to avoid the wires. The helicopter hit left skid low, rolled, and came to rest inverted. Three occupants sustained minor injuries and the remainder escaped injury. The pilot did not obtain an adequate weather briefing before this flight. He was unable to successfully transition from VFR to IFR, and his improper technique resulted in low airspeed, a high rate of descent, and sideward movement. He held standard rotary wing and fixed wing instrument ratings and had 1,700 flying hours.

WEATHER: Deteriorating, with patchy ground fog on all runways.

ACCIDENT: An OH-13E pilot filed a local night flight plan, following a daylight flight. He had checked with weather for his daylight flight and received a forecast for the remainder of the day, but he did not check the weather before his night flight. He took off to fly a right-hand closed traffic pattern and saw patches of ground fog throughout the area on the downwind leg. After completing his approach, he decided to move off the lighted pad onto the sod area to practice hovering under minimum light conditions. He hovered approximately 100 yards, realized that he was entering fog, and attempted a left turn to return to the lighted taxiway. During the turn, he saw, by the reflection of the red navigation light, that the ground was rushing under the side of the helicopter. The left skid hit the ground and separated at the cross tubes. The main rotor blades hit and shattered. The pilot escaped injury. He was not rotary wing instrument rated and had logged only 742 hours during a 6-year period.

WEATHER: Heavy overcast with intermittent snowshowers; visibility ½ to 1 mile; accumulation of approximately 15 inches of powdery snow on surface.

ACCIDENT: An OH-13H pilot made a landing approach, lost visual reference due to blowing snow, and crashed in a right skid low attitude with little or no forward speed. The helicopter rolled onto its right side. The pilot and his passengers escaped through the broken bubble with minor injuries. This pilot had more than 1,400 flying hours.

WEATHER FORECAST: Thunderstorms, severe turbulence, showers, and severe icing.

RAWF

ACCIDENT: A U-6A pilot flew into sleet and freezing rain. Icing conditions were so severe that flight could not be maintained. While in a left turn, the pilot lost control and the aircraft crashed left wing low, coming to rest on its right side 300 feet from the first point of impact. The pilot, who was not wearing his shoulder harness, sustained major injuries. His two passengers escaped with minor injuries. This pilot held a standard fixed wing instrument rating and had 1,100 flying hours.

WEATHER FORECAST: Low ceilings, fog, and reduced visibility; zero-zero in the hills.

ACCIDENT: A UH-1 pilot flew toward rising terrain and the visibility dropped. He started a 180, thought he saw a lighter area ahead, and turned back to his original heading. He flew into a thick cloud, lost sight of the ground, and started to climb. Seconds later, the helicopter crashed into a hillside, killing the pilot. The copilot sustained major injuries. This pilot was a master Army Aviator with several thousand flying hours. He held a special fixed wing instrument rating and a standard rotary wing instrument rating.

FORECAST WEATHER: Occasional low stratus across area, with light showers; 1,500 feet broken, 3,000 feet overcast; visibility 1-3 miles in haze and ground fog.

ACCIDENT: An OH-13H pilot was returning to his home field from a routine service mission. At an altitude of 1,400 feet MSL, he entered IFR conditions and executed a flare to prevent the main rotor blades and bubble from striking a tree. The tail rotor struck the tree and the main rotor blades hit another tree. The helicopter crashed on a steep slope and rolled to an inverted position. The pilot and his passenger escaped injury. This pilot had more than 1,500 flying hours and held a standard fixed wing instrument rating.

WEATHER: Low ceiling and visibility; moderate to severe turbulence from thunderstorms.

ACCIDENT: A UH-1B pilot was making a night approach to an airfield lighted by vehicle lights. The pilot experienced the loss of a visual horizon and the helicopter entered a strong downdraft. It flew through two 18-foot bushes, tearing off the battery access door and the right synchronized elevator. The main rotor blade struck a tree and the helicopter collided with a stump. One occupant sustained major injuries and the remaining two escaped with minor injuries.

WEATHER: Thunderstorm over destination; ceiling obscured; visibility ⅛ mile in rainshowers.

ACCIDENT: A U-8D, with an IP and pilot aboard, was on a dual training flight. The IP requested and was given a radar vector to the ILS compass locator. The pilot requested a descent to 5,000 feet MSL to remain clear of the clouds. He was cleared to descend and advised that he must maintain visual flight conditions. After two minutes, the pilot was given a heading change and three minutes later he was given a weather report for the destination which listed 1,000 feet, sky obscured, ⅛ mile visibility, thunderstorm, and rainshowers.

The IP reported that he would go to another airfield and turned down the offer of a radar vector. Approximately 30 seconds later, communication was lost with the airplane. It crashed about 7 miles from the compass locator in a 20° nose down and 30° right bank attitude, killing both occupants. From the evidence available, it was estimated that the aircraft's velocity was in excess of 200 knots and the rate of descent in excess of 6,000 feet per minute at impact. The IP held a standard fixed wing instrument rating and had more than 2,300 flying hours. The pilot also held a standard fixed wing instrument rating and had more than 1,000 flying hours.

FORECAST WEATHER: Sky partially obscured; visibility 2 miles in ground fog.

ACCIDENT: A U-8D was handed off to the precision radar controller at a point 7¼ miles from touchdown, as the airplane was turning to the final approach course and passing through the precision glide path. The U-8D remained above the glide

path until 1½ miles from touchdown, where it intercepted the glide path and remained on it for ½ mile. Approximately 1 mile from touchdown, rate of descent increased and the airplane went 30 feet below the glide path. The pilot was advised by the final controller to climb immediately if the runway was not in sight. The pilot was not aware that he had passed through minimums and did not understand the controller's emergency transmission.

The U-8D hit the ground 700 feet short of the runway and 150 feet left of the center line. Both main gear collapsed rearward and the nose gear was forced up through the nose section. Both propellers hit the ground and broke loose. The airplane bounced, touched down and slid for 180 feet, became airborne for 473 feet, dragging the right wing. Final impact was 612 feet from the initial impact point and the airplane skidded 600 feet down the runway. The pilot held a special fixed wing instrument rating and had more than 3,000 flying hours. Both occupants escaped injury.

WEATHER: Dewpoint-temperature spread 2°, fog and haze.

ACCIDENT: An OH-13H pilot took off without a weather briefing for a night flight, flew into fog and haze, lost ground contact, and crashed. The helicopter burned, killing the passenger. The pilot escaped with serious injuries. This pilot had no instrument rating. He had a total of 376 flying hours.

WEATHER: Broken to overcast, with numerous snowshowers.

ACCIDENT: A CH-34C pilot left on a simulated medical evacuation flight in support of a training exercise. It was next seen on the ground by the pilot of another helicopter who landed beside it to wait out a snowstorm. The CH-34C took off approximately 20 minutes later. A witness on the ground saw it turn, move off to the east, and climb into the clouds. The next witness saw the helicopter in a nose down attitude. It crashed and burned, killing all three occupants. The pilot was not instrument rated and had 500 flying hours.

FORECAST WEATHER: Severe thunderstorms with extreme turbulence; tornado warning in effect.

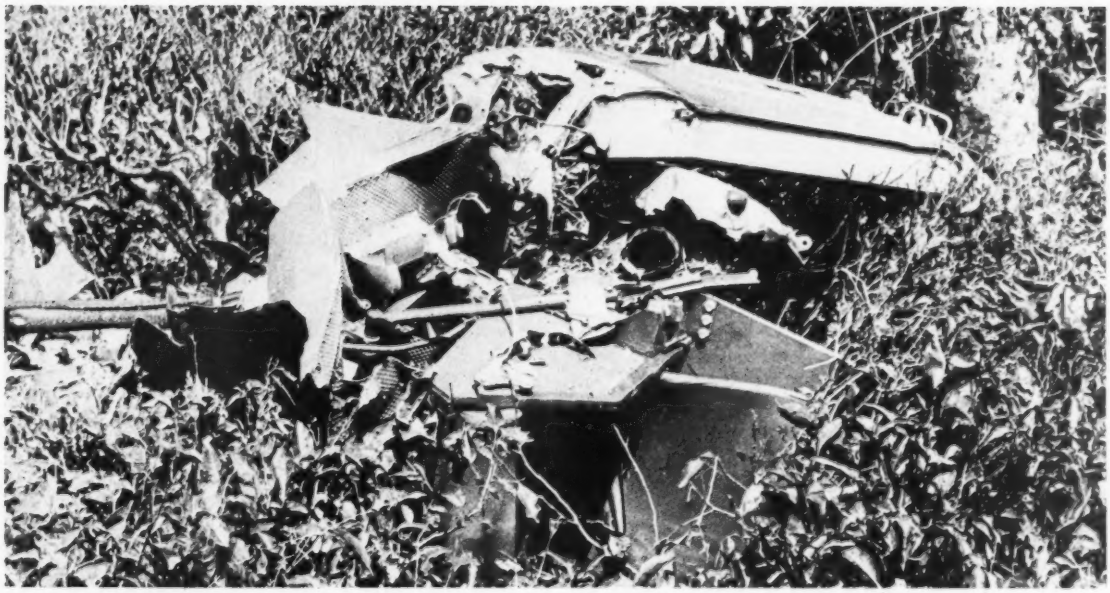
ACCIDENT: A twin engine fixed wing airplane disappeared from a radar tracking scope in an area between two large thunderstorm cells. It crashed in a wooded area, killing the pilot. This pilot had several thousand flying hours and held a special fixed wing instrument rating.

WEATHER: Fog and low clouds.

ACCIDENT: A UH-1 took off at night, climbed to 500 feet on course, and was seen to go into a steep rate of descent, apparently to avoid a cloud. It crashed and disintegrated, killing all four occupants. The aircraft commander had 1,500 flying hours and held a standard rotary wing instrument rating.

WEATHER: Fog and low clouds.

ACCIDENT: A UH-1 apparently flew into the ground at night while both pilots were suffering vertigo. It exploded and burned at impact, killing three occupants and causing critical injuries to the fourth occupant who died six days later. The last transmissions heard were: "I have vertigo!"; "Look out!"; and "We're going in!" Neither of the two pilots aboard was rotary wing instrument rated. The pilot had 900 flying hours and the copilot had 500 flying hours.



WEATHER: Prefrontal thunderstorms.

ACCIDENT: A UH-1D took off and flew toward its destination at 3,500 feet. Approximately 50 minutes later, control called and advised the aircraft commander that a heavy front was moving west between his position and his destination. The aircraft commander acknowledged, but decided to continue on course. He descended to 1,500 feet because of poor visibility. As the helicopter approached the front and apparently penetrated it, control advised the aircraft commander that the weakest storm concentration was on a heading of 180°. The aircraft commander acknowledged and stated that he would assume that heading in 30 seconds.

The last transmissions from the helicopter were monitored by control, and another helicopter. These transmissions indicated there was confusion aboard the UH-1D and it might have been out of control. The helicopter was found in an open field. It had crashed on its right side in a nose low attitude. Both occupants were killed. Neither the aircraft commander nor the pilot were instrument rated. The aircraft commander had 700 flying hours and the pilot had 800 flying hours.

These accidents cost 38 lives and more than $4,700,000.

It is clear that weather has no respect for experience or ratings. Nor does weather show any sympathy for the inexperienced and unqualified. Like the sea, it is unforgiving. Those who venture into it and commit the errors of (1) trying to get through or under its most severe forms; (2) trying to fly contact in instrument weather; or (3) trying to fly instruments without training and qualification must be prepared to pay the high price weather demands.

Some who survive weather hazards and accidents use the term "inadvertent" to describe how and why they flew into weather hazards without adequate preparation or qualification. If *you* accept this explanation, the word will make *you* an excellent epitaph.

TALES FROM THE TROJAN

The following stories were written by members of a recent Communications Skill class of Mr. Daniel M. Lewis of the Army Aviation Safety Course at the University of Southern California. Each contains an important safety message.

AS I OPENED my eyes, yawned and stretched, I felt my muscles tingle and then relax. I realized I was fully awake and looked around the barracks to see who was doing what.

There was a mixture of activity. Some of the aviation cadets were shining shoes, polishing brass, shaving, and some were still sound asleep, tired from flying the night before.

From the barracks I could hear the ground crewmen running up the engines of the AT-6s, preparing them for the day's flying. I thought about today's flying and a surge of anticipation and eagerness swept through me. Today we were to fly our low level cross-country flight—not more than 50 feet above the ground, except to clear obstacles in our flight paths.

Navigation ground school was over and this was the day we were to put our training and knowledge to use. Graduation day was just six days away. I was anxious to get started. I hurriedly shaved, showered, made my bunk, and waited impatiently for roll call.

There's the bugle! Down the stairs and outside to formation on the double. I took my place in line and again my thoughts turned to today's flying. It wasn't until my buddy, standing next to me, poked me in the ribs that I realized my name was being called for the third time. I found my voice and answered, "Here, sir."

All of the students were given maps and told to plot our intended courses. I drew my route of flight on the map and plotted the mileage, wind correction, heading, and checkpoints. As I walked up to my plane and looked at it, I couldn't help feeling excited, confident, and proud.

I started the engine, and when the instruments were in the green, I called the tower for taxi instructions. Then it dawned on me—I had forgotten to turn on the radios. I turned on the radios and called the tower: "Napier tower, this is 549 on the north ramp for taxi instructions. Over."

"Roger 549. Taxi to runway 27 and call the tower when ready to take off. Over."

I taxied to runway 27 and made my runup. Everything checked OK, so I called the tower. "Napier tower, 549 ready for runway 27. Over."

"Roger 549. Cleared for runway 27, cleared for takeoff."

I eased the throttle forward, gained speed, and lifted off the runway. After retracting my landing gear, I set the power for cruising, broke out of traffic, and leveled off at 50 feet. A glance at my directional gyros told me to turn right 20° for my first heading. On course, my attention turned to the ground passing below me. Why, this was legalized buzzing!

It Just Wasn't My Day

The sun was warm on my face so I slid the canopy back—this was more like flying anyway. I looked down at the ground again. Trees, fields, more trees, an occasional dirt road. How quickly they passed beneath me! I checked my airspeed and saw I was indicating 160 miles per hour, checked my other instruments, and again checked my headings.

My first checkpoint came up suddenly and surprised me a little. I was right on course. My first leg of the cross-country was fun, but uneventful. I made my checkpoints and my confidence grew.

I arrived at control point number 1. A flight instructor was on the ground monitoring his radio. It was his job to check off the planes as they arrived and departed on the next portion of the cross-country.

"Control point 1, this is 549 overhead. Over."

"Roger 549. Continue on your next route. Over."

"549, roger."

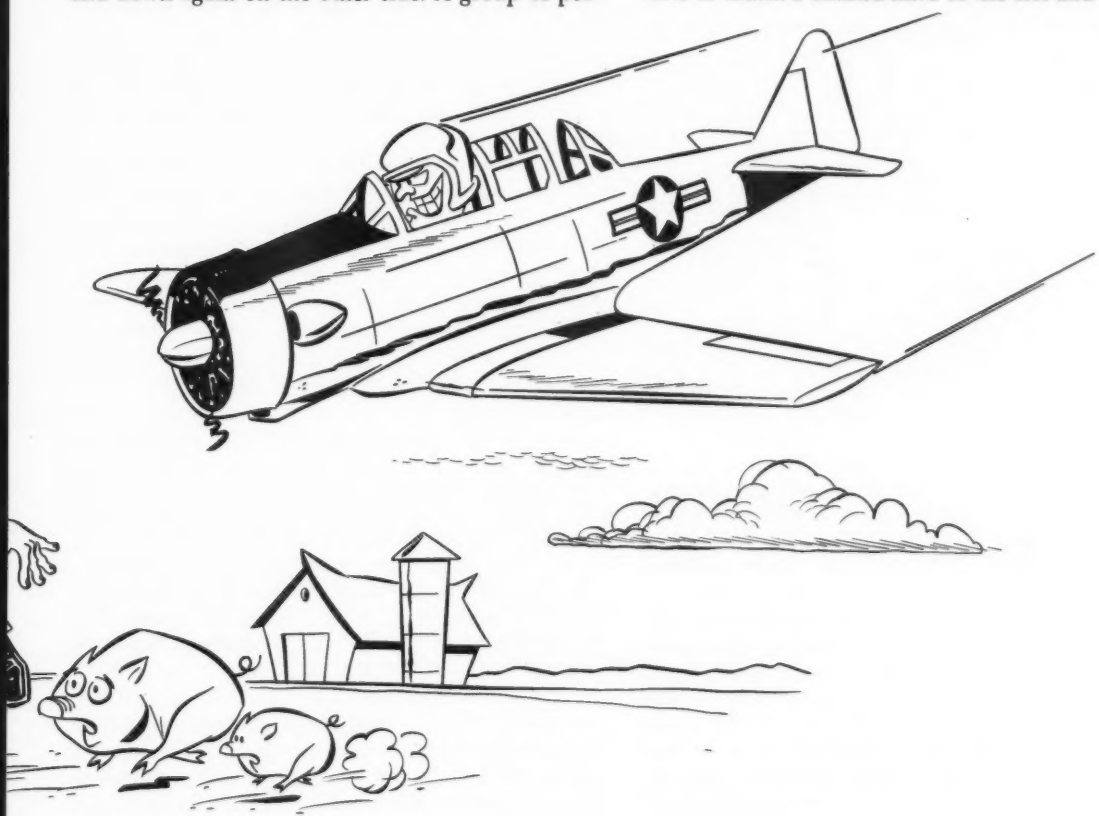
The next leg turned into real fun. All along my flight path, farm laborers were working in the fields and the temptation was too great. I flew as close to the ground as I dared—up and over a grove of trees and down again on the other side. A group of people appeared from nowhere, directly in front of me. I lined them up in my imaginary sights and squeezed my mike button for a trigger. I laughed when they ducked as I passed over them. I looked back over my shoulder and saw them waving at me. This was great!

There were more people. I headed for them and strafed them as I had the others.

My confidence and ego grew to a point where they overpowered good sense. The next target appeared in the distance, moving slowly across a field. My imagination pictured the man on the tractor as an ammunition train. I started my strafing run and had the target fixed in my sights. I squeezed the trigger again and my voice made like a machinegun.

The poor farmer looked up in complete shock and jumped off his tractor, just before I flew over him. I looked back over my shoulder with a mixed feeling of pride, amusement, and pity for the farmer. He was shaking his fist at me!

As I turned my attention to flying again, something like a high voltage shock ran through my entire body. My reflexes saved my life. I didn't have time to think. I banked hard to the left and saw an



undistinguishable blur go past my cockpit. I rolled out of the bank and climbed. As I looked back to see what had happened, I saw I had flown between a barn and silo! They were less than 50 feet apart!

Still climbing, I realized I was shaking all over. I was wet with cold sweat and felt so weak I could barely move.

I reached 1,000 feet and headed for home. My ego and self-confidence were completely shattered.

On my flight home, a hundred thoughts passed through my mind. What if I had been seen? What if the farmer complained? What if I had been killed?

I never saw a plane closing in on me. It was the air controller keeping tabs on everyone. There I was at 1,000 feet instead of 50!

The home field finally came into view and I called the tower for landing instructions. My landing was mechanical and I bounced a few times. I found a parking place, pulled in and shut down. I just sat there for a few minutes and thought about what had happened.

My legs were still weak as I got out of the plane. My hands trembled. As I walked into our briefing room, I was told by a fellow student to report to the flight leader.

Ohhhhh, no! They *knew*.

I knocked at the captain's door. I just knew I was in trouble. The captain called, "Enter and report."

I stopped in front of his desk, stood at attention, and saluted. "Reporting as ordered, sir!" My throat was dry and I tried to swallow.

"Cadet, you failed to report over control point number 2. And were reported flying at 1,000 feet. Tomorrow you will fly the course again, exactly as today. This time try to stay below 50 feet."

I'd Rather Be Home In Bed

I arrived at airfield operations at 0800 on New Year's Day for a 0900 takeoff. The operations clerk told me that the captain had already filed a flight plan and had gone to the helicopter. The airfield was located at the foot of the mountains. As I walked toward the helicopter, I saw that we had about six inches of snow on the ground. The sun was shining and visibility was unlimited. The snow-capped mountains were beautiful. The air was cold and crisp.

I arrived at the helicopter to find the captain strapped in the pilot's seat with the engine running. He said, "I've completed the preflight and I'm ready to go." I climbed up the copilot's side and strapped in. The captain began to taxi toward the runway. He had received taxi-takeoff instructions and seemed to be in a hurry.

We took off and headed east for the 30 mile flight to the pickup point. As we crossed the foothills, we could see many people skiing and sledding. When I commented on this scene, he said, "Hell, I'd rather be home in bed!" These were the only words we spoke during the 20 minute flight.

When we arrived at the pickup point, the sergeant who met us climbed in the cargo compartment and said the crew we were picking up would be late. The captain told the sergeant to go get the people because he was in a hurry. The sergeant ran behind some buildings and came back in a few minutes driving a radio jeep with a long antenna. He drove directly up beside the helicopter and one of our main rotor blades cut off about 4 feet of the jeep antenna.

The pilot said, "Hell! Now what?" He repeated that he was in a hurry and didn't want to shut down the helicopter. I ordered him to shut it down and climbed out to inspect the rotor blades. There was no damage.

By the time I had strapped back in, eight men with their bags and equipment (food and water for 15 days, and a special meal for New Year's Day) were loaded aboard. We started the helicopter and took off to the north.

We climbed out straight ahead, passing over an airfield. When I called for clearance to cross over, climbing to 5,000 feet, permission was granted, and they wished us a Happy New Year. We reached our altitude and continued our 35 minute flight.

We were 15 minutes from our destination when the pilot called the radio site and told them to be ready to go as soon as we landed, as he was in a hurry. As we approached the high mountains, the scenery was breathtaking.

About 1 mile out, I performed the prelanding cockpit check. The established procedure for landing at the radio site was to make a low reconnaissance, check the power, and determine the wind direction by a flag on a small pole. As we were a few

hundred meters from the helipad, I saw that we were set up perfectly for a low pass and a normal landing pattern. I sat back, folded my arms, and began to admire the scenery again.

A few seconds later, while still looking out the window, I saw that our groundspeed was slow. I quickly looked back into the cockpit. To my horror, I saw that we were 50 feet below the helipad, directly into the side of the mountain. The pilot had full power applied, 50 inches of manifold pressure, and the rpm was passing through 1900. I grabbed the controls just as the nose, front wheels, and main rotor hit in the snow on the side of the mountain.

The pilot sat back and put his hands over his face. Concentrating on the low rpm, I lowered the pitch. The rpm surged to the maximum, and the helicopter began to fall backwards. I instinctively pulled full pitch and we jumped 75 feet in the air. The rpm began to fall off again. I applied full forward cyclic and the helicopter fell forward, with the front wheels landing on the helipad. The right front wheel lodged itself behind a large boulder and we sat on the side of the mountain at a 45° attitude.

When I realized we were not going to roll over, I yelled to the chewchief, "Tell the passengers to jump out!" I didn't receive an answer. I looked around and saw why — the men and equipment were rolling and tumbling down the mountainside in the snow. The crewchief finally answered and I told him to have all the equipment unloaded.

When the helicopter was completely unloaded, I picked it up to a high hover and sat it down in the normal position on the pad. At this time, about 15 minutes had elapsed and the captain had not spoken or touched the controls during the entire incident.

I checked all the instruments, hovered over the pad, and determined that the aircraft could still be flown. The crewchief loaded the men and equipment aboard for the flight back. I made the return flight with full attention to flight procedures and a flight path over open and clear terrain. When we arrived at our home airfield, the helicopter was grounded until an engine and airframe inspection could be made.

Survival Is Training

A few years ago I was stationed at an upstate New York base. The unit had a variety of aircraft. We had both jet and recip aircraft, from the KC-135 down to the C-47.

The first week of October rolled around and the training officer scheduled annual survival training for the Monday morning training session. This unit devoted the first two hours each Monday morning to aircrew training. It went off about the same as I had seen for many years. First, the equipment personnel showed what survival gear was maintained in each type of aircraft. They read off a list of contents in the various size kits, depending on the type aircraft they were used in. They said there was a book on survival instructions in each kit, in case anyone ever had to use it. As usual, they couldn't afford to open them up because supplies were short and they were needed in the aircraft.

This part was followed by the usual training film on survival in the snow country. This movie showed about one foot of snow on a nice calm day with the sun shining. It showed the actions one should take when forced down. The big point of the film was that you should build a fire when forced down. This serves two purposes: It identifies your location to assist the search and rescue people in finding you, and it helps your morale because you feel better when you are warm.

The snow had started early that year, and over the weekend, several inches of wet snow had fallen after a cold rain. The wind was still blowing and it was a nasty day outside. When the movie was over, some discussion of survival started.

A young captain said, "I get the point of the fire in the survival situation, but why is it that many of the aircrews that go down in the winter never get a fire started?"

We could remember the winter before when a couple of aircraft had been lost in a mountain area close to us. The crews were not found until too late. Both happened in bad weather and the searches could not be started immediately. In one case, there was a three day delay. None of the downed crewmen had started a fire. This was food for thought, but the session broke up for coffee and was forgotten as the normal flying day got started.

The training officer came to me the next Friday and said he was getting up before daylight to go deer hunting. He said, "I've been thinking about those survival kits and would like to try one out. How about me taking one to the hills tonight and I will sleep out and be there for deer hunting in the

morning?" He flew B-57s and had to use a seat type survival kit, which contained a one-man nylon tent and a sleeping bag, plus a few small items that we could replace from stock. I told him to go ahead and have fun.

The following Monday morning, at the weekly operations briefing and training session, my friend got up to start the training portion and said, "I have cancelled the scheduled training subject today to tell you about my hunting trip over the weekend." He then related that he had driven to the mountains after work on Friday and parked his car about an hour before dark.

He walked about 2 miles across a hill to set up camp and have a good place to hunt the following morning. It was a remote area, with no houses for more than 10 miles, and nothing but woods and lakes in the vicinity. There was a foot of snow on the ground and the evening breeze was starting to blow through the hills. He got his tent up quickly and placed his bedroll and rifle on the inside. Then he started to build a fire to cook some food. He looked for dry twigs and moss by the trees, as shown by the survival movies. He could find nothing dry. The snow was wet and so was everything under it, as well as the tree branches. He tried to dry out some small twigs by burning what paper he had, including the survival book. Still, he had no fire. He just couldn't produce enough heat to get a fire started with the wet wood. It was dark by this time, so he ate some cold food and pulled off his flying boots. He crawled into the tent, thinking daylight would bring something better.

When he awoke the next morning, he saw that it had snowed several more inches. He got out of his sleeping bag to dress, only to discover that his wet boots had frozen during the night and he couldn't get them on. He had no heat to thaw the boots, so he had to get back into the sleeping bag and take the icy boots to thaw them out. After two hours, he found that he could bend the boots enough to put them on. When he was finally dressed, he tried once more to start a fire. The new energy of the morning soon played out and he still had no fire.

By this time, it was so late that he had lost his interest in deer hunting. He began to lose faith in his ability, because he could not start a fire and because he was still wet and miserable. It was an overcast day, with a low ceiling and no sun. With the new snow, which covered his footprints of the night before, he began to doubt which direction he had come from. He made a quick decision to pack his gear and get out. He gathered his gear and started toward where he thought his car was. He finally hit the road about 2 miles from the car. Needless to say, this young man had seen enough snow and hills.

"Now," he said, "I have learned enough to know that survival is tough business unless you have everything going for you. I didn't have the mental stress that goes with an accident. Also, I was uninjured. Yet, I couldn't survive in that situation."

This experience of a person everyone knew and trusted shook the confidence of all the pilots. They began to wonder just how well they would have done in the same situation. Discussion started and someone asked me, "How do you get a fire started when you are out with the Boy Scouts? You go to the same type areas in all kinds of weather."

"That's true," I told him, "but I take condensed fire pills that burn a hot flame for 10 to 20 minutes. That is usually enough heat to start a fire. They are about the size of an Alka-Seltzer and I carry a box of them in my flying suit pocket." I pulled one out and lit it in an ash tray. We all realized then that training was a personal thing and that both equipment and personal motivation would have to be improved.

The rest of that winter changed the whole outfit. New ideas were tested and new equipment went into the survival kits. Sterno and heat pills were procured and placed in the kits. Each pilot also carried his own small survival kit in a flying suit pocket. In the middle of a big snow, we would go out in pairs or groups to try our ideas in the wind and snow. Some of them worked. We discovered that the emergency oxygen bottle in the high speed parachute was seldom used in an actual emergency and could be used to make a beautiful fire for 10 minutes by bleeding the oxygen through the oxygen mask and burning it. It was like having a torch with you.

All ideas were shared and everyone made sure that he knew everything that the rest knew. It was like having a winning football team. The motivation kept us all learning. Some of the new ideas that worked well were forwarded to flight safety headquarters for distribution to other units. Recognition was given by higher headquarters. This boosted our morale and made us believe in the procedures we had developed.

By the end of that winter, we didn't require a regulation to make our crews wear proper winter flying gear, carry survival gear, and see that everyone on board was properly equipped. We were convinced that it was hard work to survive in the winter and we didn't want to make it harder by having people along that were not equipped for it.

The Longest Minute

"Take it, Bud! I've got vertigo!" The next 60 seconds seemed like 6 years.

Early in February of 1959, good fortune smiled on two young Army Aviators. We were both out of flight school less than 6 months. The good fortune was the opportunity to travel across the country with Uncle Sam footing the bill. Our mission was to pick up a CH-34 from the factory and fly it back to our home base.

Right on schedule, two days later, Bill and I were landing at Raleigh-Durham, N. C. Bill was a native North Carolinian and Raleigh-Durham had been included on our flight route.

Eight o'clock the next morning found Bill and I preparing for the day's flight. Preflight completed, we were rechecking our flight route. Our destination was Nashville, Tenn. With the exception of a general haze condition throughout the area, our weather looked good. The visibility, 2 to 3 miles, was well above our VFR minimums. As Bill was to be the pilot in command, he filed our flight plan. I left him in operations and went to the helicopter.

Our crewchief was putting his overnight bag aboard as I arrived. He appeared to have enjoyed his night. In fact, he looked as though he had enjoyed it so much that he didn't have much time for sleep.

Bill joined me in the cockpit. Our prestart and runup procedures went like clockwork. These past few days on our own had done much for both of us. Already we were both feeling like "old pro" pilots. An air of confidence filled the cockpit as we taxied out for takeoff.

Forty-five minutes after departure, we hit our first checkpoint. I was busy computing groundspeed for our first leg. We were entering the Smoky Mountains and climbing to our second leg altitude of 4,000 feet.

"Take a heading of about 255°, Bill. Our winds seem to be picking up a little from the south." I started to comment on the decrease in visibility, when it happened!

We were turning to our new heading, when it felt like someone had hit me in the seat with a sledge hammer. My eyes went to the vertical speed

indicator. It showed a 2,500 foot per minute climb. Visibility had dropped to zero. Something banged up against my left elbow. It was the collective pitch. As I glanced toward Bill, he jerked the cyclic back into my gut. I started to grab the controls when he yelled, "Take it, Bud! I've got vertigo!"

I downed the pitch, centered the cyclic, and scanned the instruments—artificial horizon, okay; rpm, okay; airspeed, 10 knots. Ten knots! Too late! I could feel the bottom falling out as we hit a downdraft. Rain and small hailstones were peppering us. All I could think about was the Smokies somewhere below us. It seemed that I was in a steep right bank. I began to correct, even though my instruments indicated a level attitude. Vertigo was overtaking me. Before I had time to tell Bill my problem, I could feel him taking back the controls. Again, I began concentrating on the instruments to follow Bill through.

Up and down we went. I had heard many times not to let the aircraft fly you. That was exactly how it felt. We seemed to be at the mercy of the elements. At least twice more, Bill and I exchanged controls. The vertigo seemed to come and go. In spite of our efforts to stay on instruments, our senses would take over. The result was instant vertigo.

Again, a tremendous downdraft pulled us toward the mountains. My eyes were drawn to the altimeter. Three thousand feet; that's too low, I thought. We must be below the tops of the mountains. I started to pull on the cyclic, when a sudden light hit my face. As I glanced out, I saw we were heading for the side of a mountain. I jerked on the cyclic and banked away. Somehow, our descent rate decreased. We pulled away from our collision course and headed down the mountainside. A hole was opening up in front of us as we came down. I saw a road in an open field, headed for it, and landed. As the wheels touched down, the weather closed in again. Visibility was zero. The longest minute was over.

Bill's drawl brought me out of my thoughts. "You know, Bud, getting those wings on our chest is no guarantee. We still have a lot to learn about flying."

"Amen!" I thought.

Look Before You Touch

It was a dismal day at a northwest air station. I got there at 0745 and had time for a second cup of coffee and some yak with the other guys before it was time to fly. I was assigned as pilot in a twin engine Grumman Albatross for a local training flight.

I was one of 20 pilots assigned to a search and rescue unit. The aircraft attached to this unit consisted of three Grumman airplanes and three turbine powered helicopters.

By 0900, I had filed a local flight plan and was in the air. Due to low cloud cover, I decided to remain in the local traffic pattern and practice landings.

I had flown for 30 minutes when operations called and requested me to make a logistic flight to a Naval air station 50 miles to the east.

A weather check at the NAS showed the field to be VFR, reporting 1,000 feet overcast and 3 miles visibility. However, the en route weather was unknown. I decided to attempt a VFR flight to avoid the delay of getting an IRF clearance.

We proceeded eastbound with no difficulty until about halfway to our destination when the weather began to deteriorate. I decided to attempt a climb to VFR conditions on top and obtain an IFR clearance to the Naval air station. I reversed my course at this point to locate a break in the clouds which would allow us to climb on top. I found a break after about 10 minutes and climbed to VFR with no trouble.

When we were at 4,000 feet on top, inbound to the air station, I called air route traffic control and got an immediate IFR clearance. We had about 20 minutes to go.

Radar and TACAN were the two approach facilities serving the Naval air station. Since an IFR approach was imminent, I set up the necessary instruments on my side of the panel by actuating a switch on the overhead panel.

Approximately one minute later, the no. 1 engine coughed twice and then stopped. I called for the engine to be feathered. I advised ARTC about our situation in a somewhat strained "no sweat" tone. We were handed off to approach control, and they gave us radar vectors to the final approach course. By this time, we had descended into the clouds. Because of the stress, erratic control seemed to be the order of the day. Heading and altitude corrections were anything but precise.

We broke out at 1,000 feet and I saw that we were decidedly high and fast. I reduced power on the good engine to lose altitude.

We could see the crash vehicles about midfield, with their red rotating lights flashing. It was obvious they were expecting the worst, and this didn't help our feelings.

We crossed the threshold, still slightly fast. The airplane settled to the runway in a typical not-my-day fashion and a feeling of obvious relief was apparent in the cockpit. That is, until we realized we were rolling much too fast and now I had the problem of trying to stop with brakes only. Reverse

pitch could not be used because of the dead engine.

We stopped just short of the overrun. The next thing I knew, the crash vehicle was alongside spraying foam all over the right landing gear which was smoking because of excessive braking.

We immediately got out of the aircraft and the problem was soon under control. I re-entered the aircraft to shut off the switches. While in the cockpit, I saw the emergency fuel shut-off switch for the no. 1 engine was in the OFF position. "This couldn't be," I told myself, somewhat doubtfully. Just to make sure, I attempted to restart and the engine came to life immediately.

It was determined that when I had switched instrument control, I had inadvertently turned the fuel switch off. The switches are close together.

Perhaps I could say it was poor cockpit design and possibly it was, but I have now acquired a firm habit. I always look before I touch!

I Consider Myself Lucky

My first recollection of that eventful day was when the babu, or room boy, awakened me at 0300. The date was 4 November 1946. I was employed as a captain for an overseas aviation corporation, a commercial air carrier. As I dressed, I mentally reviewed my day's work which was to fly a C-46 from Calcutta, India, to Shanghai, China, with intermediate stops at Bhamo, Burma; Kunming, China; and Chungking, China. As I walked from my quarters to the mess hall, the rotating beacon on the hangar was reflecting off low clouds and a light monsoon rain was falling.

As I entered the mess hall, I was greeted by my copilot and radio operator, who were having their usual breakfast of noodles and eggs. Thinking of the flight ahead, I ate a substantial breakfast of steak and eggs before we went to flight operations. As we checked in, I was told that my load would be 14 passengers and cargo, for a total 50,000 pounds, or maximum gross weight for this type airplane. The load manifest checked out and I walked to the weather office. Calcutta was giving an 800-foot ceiling and 1 mile visibility in light to moderate rain. Bhamo was giving a 1,200 foot overcast, with 5 miles visibility. No en route weather was available.

I told the copilot to pull all the oil and gas caps and make sure that we had a full fuel and oil load. I told the radio operator to check out his radio equipment, then made an external preflight. I found no discrepancies, so I went back to operations and told them to load the passengers, consisting of two British nationals who were operating tea plantations near Bhamo, Burma; one American mechanic; and 11 Chinese.

When I boarded the aircraft, the distribution of the load did not look quite right. Three sections of seats had been lowered on both sides of the cabin, immediately behind the forward bulkhead. All of the cargo was tied down aft of these seats. However, the manifest showed that we were within gross weight and center of gravity limitations. I was running about 30 minutes behind schedule, so I did not question the load. I walked up to the cockpit to check out the rest of the airplane.

We checked all the equipment and found everything normal, so I started the engines. By this time, we were running about 45 minutes behind schedule. Our landing lights were extended, the windshield wipers turned on, and the tower acknowledged our request for taxi and takeoff instructions. We were cleared to taxi to runway 27 and await further clearance. I stopped in the runup circle, short of the active runway, and proceeded to check out instruments, radios, and engines. Everything was within the limits, so I called the tower for takeoff and climb clearance. We were immediately cleared for takeoff and climb on course to 12,500 feet, to be maintained until we were over the Bhamo radio beacon.

As I eased the throttles open on the takeoff roll, everything seemed normal. However, I soon noticed that it took more than a normal amount of forward elevator trim and forward pressure on the control wheel to get the tail up to level altitude. Once airborne, with the gear up and power adjusted for the climb, the aircraft seemed to stabilize.

We entered the overcast at approximately 800 feet, and settled down for the climbout to our

assigned altitude. As we reached 12,500 feet, we were still on instruments. We leveled off, adjusted to cruising power, and put the airplane on auto pilot.

After about 15 minutes, we began to encounter light to moderate turbulence and fairly heavy rain. There was lightning ahead and on both sides of our course. As we flew into the thunderstorm, I computed that we were over the edge of the Petkai Mountain Range. The turbulence increased to a point where it kept me busy trying to give the passengers as smooth a flight as possible, and, at the same time, keep from overstressing the airplane.

Trouble came with a bang. We heard a rapid series of explosions in the right engine. It was vibrating and twisting so badly that I cut the mixture and feathered the propeller as quickly as possible. My first action after feathering was to make a 180° turn back toward Calcutta, as I figured I had penetrated the thunderstorm over the edge of the mountains, and the terrain from the foothills of the Petkai Range back to Calcutta is a delta.

I told our radio operator to notify Bhamo of our turn-around and to tell Calcutta that we were returning on one engine. I then reduced power on the good engine and allowed the airplane to drift slowly down as we neared Calcutta. The ceiling was still 800 feet, so I decided to continue my descent to VFR conditions below the overcast, rather than make an instrument approach.

By this time, our mechanic entered the cockpit and wanted to know what was wrong with the engine. I told him that I didn't know, but we were descending to VFR conditions and should be back in Calcutta in about 20-25 minutes. At about 850 feet, we could spot an occasional light. At 750 feet, we were in the clear below the overcast. I increased power on my good engine, attempting to maintain altitude. However, with maximum power and allowable rpm, we were still descending slowly and the airspeed was decreasing.

I extended the landing light on the left wing and saw palm trees passing underneath. They were much too close for comfort. It was now evident that I would not be able to maintain flight, so I told the mechanic to get help from the passengers and throw some cargo overboard. It seemed as if the tail were dragging in the trees before I felt the airplane begin to respond and was able to nurse it back up about 500 feet. By this time, I had the lights of the airport in sight. We made radio contact and landed.

Dawn was just breaking as I walked back to the crew quarters. I was mad with myself for not having the load rechecked and with maintenance for giving me a bad engine. However, it was not until the next day that I realized the full extent of my errors. *There was no engine malfunction. It started and ran perfectly. This left only one answer: severe and sudden carburetor icing. I had failed to maintain enough carburetor heat in the thunderstorm, and I had let down too low before trying to maintain altitude on one engine, when I previously had reason to suspect the load.*

I consider myself fortunate that I did not kill 17 people that night.

pearl's

personal equipment
and
rescue/survival
lowdown

Dear Army Aviation Crewmembers:

Tracer ammunition is available for both the .38 and .45 caliber sidearms. These are listed in "Department of Defense Ammunition Codes," dated July 1965. Nomenclature and Federal Stock Numbers are:

Cartridge, Ball, Steel Jacket, with Tracer, .38 Special—FSN 1305-A406.

Cartridge, Caliber .45, Tracer—FSN 1305-A479.

Birdshot is available for the .45 but is not listed for the .38 Special. For the .45, it is listed as:

Cartridge, Caliber .45, Shot—FSN 1305-A478.

A word to the wise — If you are down in hostile territory and use tracer as a distress signal, you stand a good chance of drawing return fire.

Dear Pearl:

The top fitting pad in my APH-5 helmet keeps falling out. I have heard that some glues will adversely affect the styrofoam liner, so have hesitated to use glue. What do you suggest?

CPT Fallout

Dear CPT Fallout:

You are so right! Glues with a methyl ketone base (model airplane glue) *will* deteriorate the styrofoam liner of your helmet. Paragraph 3-8, TM 10-8415-202-13, the maintenance handbook for the APH-5, states (for operator maintenance): "Apply double coated pressure sensitive tape to the sizing liner and install on the energy-absorbent liner." Federal Supply Catalog C 7510/30—IL-A, dated March 1966, lists two types of double coated tape: FSN 7510-634-5036 and FSN 7510-550-7815. Both should be acceptable. Remember the sizing pads are *not* designed to be permanently bonded to the helmet. You should be able to remove the pads for cleaning or replacement without damaging the styrofoam liner.

PEARL

pearls

Dear Pearl:

What is the authority for drawing the pilot's survival knife? Can pilots in CONUS draw these?

LT Curious

Dear LT Curious:

Yes. The latest TA 50-901 is your authority. It is dated 5 October 1966 and lists the knife as "Knife, Hunting: 5 inch blade. . . ." It is authorized worldwide on the basis of one per aviator and one per crewmember on flying status.

PEARL

Dear Pearl:

We read your article before our requisition got out for the MK79 MOD 0 pen gun flares. Better give this new information to the instructors in the Safety Orientation Courses, since they gave us the following stock number . . . 1370-866-9788.

Kindly forward your local purchase source for the new pen gun flares, stock number 1370-921-6172, in order that we may local purchase them for our National Guard aviators.

If you have a current stock number for that pretty gauntlet glove you wore in the picture, we will appreciate that information also, since we continue to receive short gauntlet gloves in our supply system.

LTC John S. Sargo
Army Aviation Flight Activity Commander
Wisconsin Army National Guard

Pearl:

I saw with interest your article regarding pen gun flares in the February AVIATION DIGEST. Please send me the source of these flares so my unit may purchase the pen guns and flares.

MAJ Joe E. Gray
Inter-American Geodetic Survey
Guatemala Project

Dear Pearl:

I am writing in reference to your article on pen gun flares which appeared in the February issue. . . .

I would appreciate having the source for these in the area of Fort George G. Meade in order that we might local purchase them for our crewmembers. . . .

CPT Raymond Magana, Jr.
Supply Officer
First U. S. Army Flight Detachment

Gentlemen:

Thanks for your letters and interest. It is no longer necessary to local purchase the new flares. Listed as Line Item Number T 51271 5, FSN 1370-921-6172, they have now been approved for worldwide Army use. Authority is message AMXCP-A1 (EBP) 3619, from U. S. Army Support Center, Personnel, Philadelphia, dated 24 January 1967. The flare kits are available through the U. S. Army Ammunition Supply and Procurement Agency, Joliet, Illinois.

The same message also authorizes the Type B3A gray gauntlet gloves I wore in the February issue. Listed in DA Supply Catalog 8405/25-IL-A, page 19, the gloves are Line Item J 67705 8, FSN 8415-782-6306 through 6312 (for sizes 6½, 7, 7½, 8, 9, 10, and 11). These gloves are authorized for each Army aviation crewmember and qualified parachutist.

These changes will be reflected in the next published change to CTA 50-901.

A quick "save" through the use of the pen gun flare was recently reported. An IP gave his student a simulated forced landing and the engine failed to respond when power was applied for recovery. They overshot a strip and crashed into trees. The IP fired three flares, and the pilot of another airplane, two to three miles away, immediately spotted them.

I recommend you establish a training course on the pen gun flares to make sure all crewmembers understand how to use them. While simple to operate, the pen gun flare is a pyrotechnic device and should be held at arms length when fired.

I've had lots in inquires about the status of the NOMEX flight suit. Next month (May) I'll try to give the complete history of the NOMEX suit, along with some of the "why's" we still do not have a protective flight suit. Unfortunately, it does not appear likely that we'll have one in the very near future.

I hope you never have to use your pen gun flares in an actual emergency, but please carry them on *all* flights—just in case. If you should ever use any of your personal, survival, or signal equipment during any kind of emergency or mishap, I'd like to hear from you so we can share your experience with others. I'd also like to have any questions you may have about this equipment. Please write to me c/o USABAAR, Fort Rucker, Alabama 36360.

See you next month,
PEARL

A FORECAST OF PERFORMANCE- N_1 OR TORQUE?

Elton J. Smith
Supervisor, Flight Operations Analysis
Bell Helicopter Company

SERVICE EXPERIENCE with the UH-1 series has revealed that accidents have occurred during takeoff due to a lack of reserve power. These accidents can be prevented if the pilot has an accurate indication of power reserve. The pilot has two instruments which are accurate indicators of power. These are the torque meter and the N_1 or gas producer tachometer.

Quite a bit of legitimate discussion has been generated among UH-1 operators concerning the merits of the N_1 gauge versus the merits of the

FIG. 1 T53-L-11 ENGINE
AVAILABLE TORQUE VS. PRESSURE ALT.

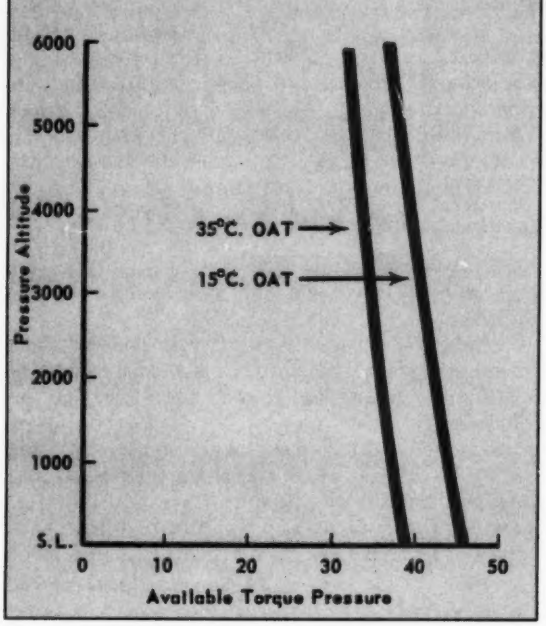
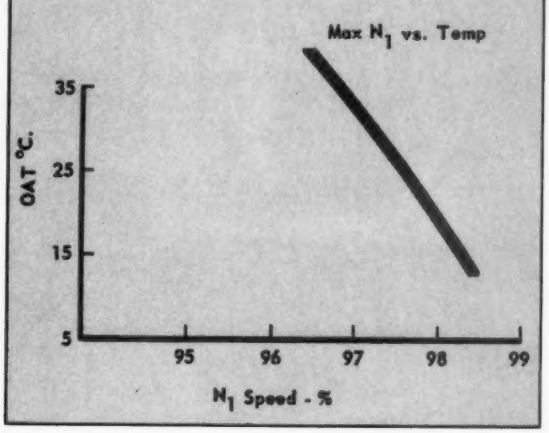


FIG. 2 T53-L-11 ENGINE



torque meter as to which is the prime indicator of engine and/or helicopter performance.

Power margin (the difference between the power required to hover and the power available from the engine) can be determined from either the torque meter or the N_1 tach.

It is obvious that the power required to hover can be determined by observation of either the torque meter or the N_1 tach during hover. To determine power margin the pilot needs to know maximum power available.

The maximum power available as indicated by the torque meter is affected by two variables: pressure altitude and temperature. A presentation of available torque as it varies with altitude and temperature is shown in figure 1 below.

To determine the torque available, reference to the handbook must be made unless a torque available flight check is conducted for the applicable altitude and temperature condition.

The maximum power available as indicated by the N_1 tach is affected by only one variable—temperature. A typical variation of max N_1 power available as affected by OAT is shown in figure 2 below. This graph depicts maximum N_1 speed ("topping") for a typical engine. This value will differ slightly among individual engines.

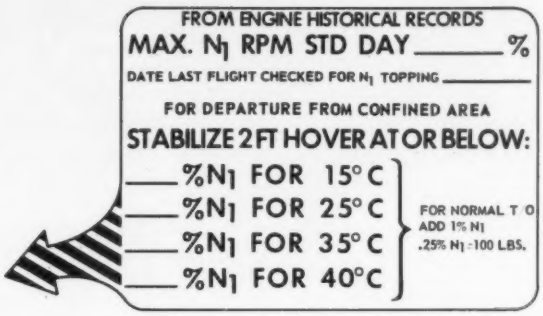
Flight tests have demonstrated that a power margin of 5-6 psi torque or its equivalent of 3 percent N_1 at a 2-foot hover will reduce the horizontal distance required to clear a 50 foot obstacle by two-thirds. Either of these power margin values is equivalent to approximately 135 horsepower when using the T53-L-9, -9A, or -11 engines. A 2 percent N_1 reserve will produce the same horsepower margin when a T53-L-13 engine is installed.

Power margin is computed using the torque meter as follows:

- Ascertain torque available from handbook (or aid) for altitude and temperature condition.
- Hover aircraft at 2-foot skid height and observe torque indication.
- Adjust load such that a minimum of 5-6 psi power reserve exists.

Power Margin Determination Using N_1 Tach:

An aid has been developed which provides the required takeoff power margin by use of the N_1 tach. The aid (above right) is called the Go-No-Go placard and is affixed to the instrument panel with the arrow pointing to the N_1 gauge. A different placard will be provided when the T53-L-13 engine is installed, since a different percent N_1 reserve will produce the same horsepower margin as other T53s.


FROM ENGINE HISTORICAL RECORDS
MAX. N1 RPM STD DAY _____ %
DATE LAST FLIGHT CHECKED FOR N1 TOPPING _____
FOR DEPARTURE FROM CONFINED AREA
STABILIZE 2 FT HOVER AT OR BELOW:
___%N1 FOR 15°C
___%N1 FOR 25°C
___%N1 FOR 35°C
___%N1 FOR 40°C
FOR NORMAL T O
ADD 1% N1
.25% N1 -100 LBS.

The placard presents the N_1 speeds at which the individual engine produces maximum power at 15°C. OAT. Also shown on the placard is maximum N_1 speed, less 3 percent, for ambient temperatures of 15°, 25°, 35°, and 40°C. These N_1 speeds for corresponding temperatures, when not exceeded, provide adequate power margin for takeoff from a confined area.

NOTE: The skid height at which power reserve is established is critical. Should the 3 percent N_1 or 5-6 psi torque reserve be established at 4-5 feet, a vertical takeoff could be accomplished. It is difficult, if not impossible, to present a procedure that will encompass all confined area operations.

IT IS THEREFORE EMPHASIZED THAT RESERVE POWER FOR A CONFINED AREA TAKEOFF BE DETERMINED AT 2-FOOT SKID HEIGHT.

It has been shown that power margin can be accurately determined by use of either the torque or the N_1 indicator. However, use of N_1 indicator is recommended since the margin can be determined by use of cockpit information (N_1, Go-No-Go placard and OAT), whereas the torque method requires advanced reference to handbook information. In addition, the N_1 method will provide adequate power margin even though the engine may have suffered from deterioration.

NOTE: There are conditions of temperature and altitude, especially with the T53-L-13 engine, where complete concentration on N_1 could result in an overtorque. Therefore, it is essential that both instruments be monitored during the takeoff phase of operation.

Regardless of the method accepted by the user, it is emphasized that a knowledge of power margin will significantly reduce accidents resulting from "Russian Roulette" takeoffs. Good flying!

Upper left: Surviving Japanese fishermen arrive at Hamby Army Airfield, Ft Buckner, Okinawa. Above: Flight detachment personnel comfort the survivors before transporting them to Koza Hospital. Below: The crew which rescued the fishermen from the coral reef in the East China Sea.

Shawnee Rescue Mission

A U. S. ARMY CH-21 helicopter landed on a jagged coral reef to rescue the 10 survivors of an 11-man crew of a Japanese fishing boat, which sank after striking the reef. Stranded for six days and exposed to the elements with virtually no clothing, the shipwrecked fishermen subsisted on rainwater from hollows in the coral and a few hardtack biscuits they were able to salvage. Clothed only in shorts or loincloths, they huddled together in a small cave at the highest point of the reef above the highwater mark.

The chopper from the flight detachment, Hamby Army Airfield, Fort Buckner, Okinawa, flew the mission after being alerted by the U. S. Civilian Administration, Ryukyu Islands. The reef is located about 15 miles north of Kume Jima Island, which is about 65 air miles from Okinawa.

Three of the survivors practically had to be carried to the chopper but the rest were able to walk with assistance. All that could be ascertained from the non-English speaking castaways was that their boat was the "Takuyo-Maru #3" and that they were sick, hungry and cold.

Upon arrival at Hamby Army Airfield, they were bundled into blankets, placed on stretchers aboard ambulances and transported to Koza Hospital.

Q Course students in formation flight at Ft Rucker

New Q Course Graduates First Students

TWENTY-ONE Army Aviators, previously qualified in fixed-wing aircraft only, have recently completed the first *new* Officer/Warrant Officer Rotary Wing Qualification Course to become rated in the OH-13 and UH-1.

During this course the aviators received instruction in external loads, low level navigation, in which FM homing and tactical instrument procedures were taught; gunnery training, using the XM-20 (XM-134, 7.62 mm minigun) and the M-6 (7.62 mm machinegun); airmobile operations, stressing the tactics used in airmobile units; and day and night formation flying, takeoff and landing into tactical landing sites, and navigation was taught.

This new qualification course is an outgrowth of the Q course taught at Fort Wolters, Texas, until it was moved to Fort Rucker, Alabama, in the fall of 1965. Since the majority of the students were receiving transition training for duty in Vietnam, revision of the program of instruction was needed to improve tactical training, especially tactical instrument training. The new Q course consolidates in one course all training the aviator needs to qualify fully as a rotary wing pilot.

A test of the new course was given to eight students from RWQC 66-5. The POI broke down into 25 flight hours in the OH-13, 21:15 flight in the UH-1, 18:45 flight hours in tactical instrument training and 8 flight hours in tactics training. This test course was approved with an increase in tactical training to 12 hours.

Although it is expected that this new course will also be modified as demands or needs change, it does provide the transition student with more complete training specifically directed to today's requirements.

For further information see "New Rotary Wing Qualification Course," January 1967 AVIATION DIGEST.

MG Delk M. Oden Is 7th Commandant At Fort Rucker

MAJOR GENERAL Delk M. Oden, the new commanding general of Fort Rucker, has had two previous assignments to the Alabama installation he now commands.

Nearly ten years ago he was a student aviator at the U. S. Army Aviation School. Then in May 1959 he returned to serve as assistant commandant of the School.

A native of Gordon, Texas, General Oden was graduated from Marion Military Institute at Marion, Ala., and is a graduate of the U. S. Military Academy, class of 1937.

After two years with the 27th Infantry in Hawaii, General Oden returned to the continental United States. He served with the 7th and 10th Cavalry units until January 1942.

His next assignment was to the 4th Armored Division. He stayed with the division from 1942 to 1945, taking part in its five campaigns in Europe. During this time he commanded the 704th Tank Destroyer Battalion, the 35th Tank Battalion, and subsequently became Chief of Staff of the division.

In 1946 General Oden was ordered to the Pentagon to serve on the War Department General Staff.

Following a short tour there, he attended the Command and General Staff College, Fort Leavenworth, Kan., and upon completion, he was reassigned to the Pentagon. He became Assistant Secretary of the General Staff, U. S. Army, where he served until August 1949.

Next, he attended the Armed Forces Staff College, Norfolk, Va., and, following graduation, was assigned to the Joint Military Mission for Aid to Turkey. He served first as Director of Instruction at the Turkish Armored School at Ankara, and then became Chief of Staff, Joint Staff, U. S. Mission for Aid to Turkey. He held that position until June 1952, when he returned to the United States and attended the Army War College at Carlisle Barracks, Pa.

General Oden's next assignment was to Austria, where he was Chief of Staff, U. S. Forces, for two years, and later became U. S. Army Attaché in Vienna until October 1956.

Following an assignment on the Regular Army Augmentation Board, he came to Fort Rucker for the first time, to take aviator training. He is now qualified in rotary wing, fixed wing and twin-engine aircraft.

MG Delk M. Oden
Commander of the U. S. Army Aviation School and Center

After serving as commander of Combat Command A, 1st Armored Division, Fort Polk, La., from December 1957 until May 1959, General Oden returned to Fort Rucker the second time.

After his tour as assistant commandant of the U. S. Army Aviation School, in June 1961 he once again returned to Washington, where he became the Director of Army Aviation.

An assignment to Vietnam followed in 1963. There he served as Chief, Army Section, Military Assistance Advisory Group in Vietnam. Later, he moved from MAAG to assume command of U. S. Army Support Command, Vietnam.

He comes to Fort Rucker this third time from his most recent assignment as Director of Officer Personnel, Office of Personnel Operations, Department of the Army. He is the seventh commandant to serve at Fort Rucker.

Among General Oden's many decorations are the Distinguished Service Cross, Silver Star with Oak Leaf Cluster, Legion of Merit, Soldier's Medal, Bronze Star with "V" Device and Oak Leaf Cluster, Air Medal with six Oak Leaf Clusters, Purple Heart with Oak Leaf Cluster, Croix de Guerre with Palm, and the Czech War Cross.

He is married to the former Margaret Avery, and they have three children, Delk Avery, Margaret, and Ray Lawrence.